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Work

WORKS managers representing a number of our big industrial companies, including several leading electrical manufacturing concerns, met in London last Friday. Their object, as members of the British Works Management Association, was to talk about ways and means either already employed or suitable for adoption, for improving Britain's industrial efficiency—that is, producing goods more economically and at competitive prices.

Mr. G. Hurford, Director of Manufacture to Standard Telephones and Cables, Ltd., and chairman of the Association, emphasised the immediate importance of the office of the works manager in maintaining the efficiency of the industrial fabric; the normal processes of manufacture, he said, must not be disturbed by economic adjustments. The standard of life and weight of taxation in this country demanded that we should have higher standards of efficiency than our competitors. Mr. Hurford claimed that only the industrial managers possessed both the knowledge and the opportunity to secure this result.

Other speakers were: Mr. Frank Hodges, who said something about rationalisation; Mr. E. J. Fox, who stressed the importance of co-operation and team work; Mr. R. R. Hyde, whose theme was the human factor; and Mr. A. P. Young, manager of the B.T.H. works at Rugby, who said that if industrial mechanisation was to be successful it must recognise and suitably reward the four partners—hand and brain workers, investors, management, and customers.

No doubt discussions of this character are helpful to the members whose individual efficiency is increased by interchange of ideas. They make great claims regarding the influential position that they occupy, and consequently must carry heavy responsibility. But whether we are works managers or workers at the bench we have all got to pull a fuller weight in the future than in the past—it is useless to imagine otherwise.

The atmosphere of many conferences where in the past we have discussed ideals and aspirations has been very close. To-day we are out in the storm, and it may well happen that on the rocks of hard circumstance some of our fond ideals will come to grief, or at least their realisation will stand deferred.

If the industrial manager can prove in these days his ability to carry on with increased efficiency and improve our competitive ability throughout the world, without affecting the standard of life at home, he will prove our fears to be unjustified and will have deserved well of his generation.

It may seem strange when there is not enough work to go round for us to preach a doctrine of working more strenuously and efficiently. Yet may not the solution of finding work for others lie in sticking harder at our own job and increasing our output? We have not reached the millennium. We have failed in our efforts to make a New World. Why not frankly admit it and work hard to recover the ground that has been lost?

British Illuminating Glassware.

THE summarised National Physical Laboratory tests report on British and foreign illuminating glassware in the "Notes" section of this issue shows plainly that there is no need to go abroad for the material, and that England can hold its own if given anything like a chance. The British manufacturers are and have been severely handicapped in this connection for a good many years, owing largely to the foreigner having a good lead and to very heavy dumping, but more so perhaps to the prevailing impression that the foreign article is much superior. The makers in question are confident that they can get increased orders, and that with the consequent increased practice they will not only beat the foreigner in three-ply glass, but that they will also overcome the small difference of one to three per cent. in opal glass.

The British in China

WE venture to draw the attention of the Council of the B.E.A.M.A. to the plea made in this issue by Professor Middleton Smith. It is, in fact, a demand that they should take full advantage of the opportunity offered to them to increase their export trade in the Far East. The plan is quite simple and it is not unfamiliar. In effect it is this. A number of Chinese engineering graduates, trained in English engineering standards and fluent both in the Chinese and in the English languages, desire to obtain practical experience in works in England. Not only that—they want to have that experience so that they may sell British engineering goods in China. For nearly twenty years Professor Middleton Smith has attempted to link up British engineering factories with the great country of China. A few years ago he published a book, "The British in China," with that object. He has been indefatigable in this great aim. A few years ago something on a very small scale was attempted, but what is being done now? Surely it is "up to" the B.E.A.M.A. to make the necessary arrangements, so that a goodly number of young Chinese, speaking English fluently, may be trained in England as missionaries for British engineering goods in China.

Jerusalem

INTERESTING progress is being made in the electrical modernisation of Jerusalem. Both there and at Bethlehem the streets are now electrically lighted. The Jerusalem system includes 22½ miles of overhead lines and 21½ miles of underground cable, and the power-station plant has been extended to meet the growing load. There are 3,300 lighting and power consumers, and there is a steady flow of new applications for supply; there are various new large consumers waiting to complete negotiations, but the economic stress of the world in general has led them to hold their hand. Jerusalem, of course, depends upon tourist traffic to a considerable extent, and a lull in that branch of business does not add to electricity consumption. The outlook on the whole, however, is held to be favourable, according to the statement made by the Local Director, Mr. L. Le Bouvier, at the annual meeting of the Jerusalem Electric and Public Service Corporation, Ltd., held in London last week.

Water Heating and the Architect

WE have often drawn attention to the need for closer collaboration between electrical engineers, architects, and builders in regard to the installation of electricity, especially in new property. This need is especially strong in the case of water heaters, as builders and architects might quite well adapt the lay-out of a kitchen or bathroom to permit the installation of the most suitable type of water heater. We do not suppose that the present shape of this last link in the chain of the all-electric house necessarily represents the final design. It is certainly a sign of the times that our contemporary the *Builder* should include an article on domestic electric water heating in which this plea for co-operation is ably advanced. We trust that it will be noted and acted upon by its readers. Electrical men are more than willing to do their share.

The E.D.A. Conferences

NEXT Friday sees the commencement of the 1931-32 Salesmanship Conferences organised by the British Electrical Development Association. The subject is the rather scientific one of light therapy, and the speaker is a well-known medical man who has had considerable experience in this direction, Dr. W. Beaumont. Extravagant claims have frequently been made with regard to cures alleged to have been effected by means of light treatment. While these stimulated public interest in the matter for a time, they were too flimsy a base for a lasting business, and there was a reaction. We believe that there is a wide scope for the use of light for curing, or, at least, alleviating, certain disorders, but care must be taken that apparatus is used aright and that its attributes are not exaggerated. Dr. Beaumont's lecture will, no doubt, provide material for sound and persuasive sales arguments, and those who attend the first E.D.A. Conference will derive from it a great deal of interest and useful knowledge of an electrical application that has not been too well handled in the past.

Bernard Drake

IT is many years since Mr. Bernard Drake, whose death it is our sad duty to record this week, first established for himself, and for the business which bears his name, a substantial reputation in the British electrical industry. Few, if any, concerns have installed electricity in so many of the stately homes of England and the London mansions of people of distinction; installations in big business houses and industrial works followed as a matter of course. Electrical men of middle age will recall his connection with the Jandus and other arc lamps, and the Nernst lamp, but the manufacture of secondary batteries was the development of the industry with which he was longest concerned, for the interest that began therein forty-seven years ago was sustained to the last.

Norwich Demonstration Scheme

WE are informed by Mr. F. M. Long, City Electrical Engineer of Norwich, that the anticipations of an early financial success for his rural electrification scheme are likely to be more than justified. Instead of the three years or so forecast by the Electricity Commissioners as the period within which the countryside area would contribute its share towards the whole of the charges on the Norwich undertaking, Mr. Long believes that the benefit of the increased output will be felt within two years. This confidence appears to be justified by the encouragement of the water-heating and space-heating loads at the competitive rates together with a progressive policy of educating the consumer.

The Faraday Exhibition

THE organisers of the Royal Albert Hall exhibition had no thought of making money. They set themselves the task of honouring Faraday by interesting the public in his achievements, and it is a pleasure to associate ourselves with the desire of the organising committee (chairman, Lt.-Col. W. A. Vignoles; organiser, Mr. Lewis) to record its indebtedness to the many manufacturers who, through their respective Associations, co-operated in an undertaking of this magnitude on non-commercial lines. The exhibition was visited by 50,000 people. School headmasters and science teachers alone organised over 400 parties. The 350 voluntary helpers provided an example of co-operative public-spirited effort on the part of men of science, chemists, engineers, and industrialists, led by the I.E.E., of which all concerned may be justly proud.

The Electric Drive in Factories. By W. P. Conly, M.Sc., A.M.I.E.E.

A comparison with the crude-oil engine, and some data regarding the consumption of electricity per horse-power installed in different trades

THE most important competitor of electricity in factories of medium size requiring 70 to 100 horse-power is the crude-oil engine. In smaller factories, where space is generally the deciding factor and the prime cost per horse power of the oil engine relatively great, or in larger works, where low rates for electricity would be offered, the competition is not severe

The demand of a medium-sized works, on the other hand, may be too great and the annual consumption too low to enable the undertaking to quote an attractive rate, having regard to the capital expenditure involved in the provision of a sub-station, transformer, switchgear, &c.

Oil-engine salesmen have said that the consumption of fuel is about 0.5 lb. per brake-horse-power hour, which is equivalent to a cost of 0.4d. to 0.5d. per kWh generated.

The average factory will, in normal times, be worked for about 2,400 hours per annum. Assuming an electric motor to have an efficiency of 85 per cent., the factory owner will often infer that the electric motor will consume $746 \times 2,400/1,000 \times .85 = 2,106$ kWh per annum per h.p. installed, costing, with electricity at 1½d. per kWh, £10 19s. 4½d. per annum per h.p. installed.

The price of fuel oil varies with the locality, being cheaper at the seaports than inland areas. A fair average may be taken as £4 5s. per ton, and on this basis the cost would presumably be £4 5s. $\times .5 \times 2,400/2,240 =$ £2 5s. 6½d. per annum per h.p. installed.

Actual Consumptions in Different Trades

The above hypotheses do not represent practical conditions as will be evident from the accompanying table, which has been carefully compiled from a census of hundreds of factories and workshops all driven by electricity, grouped together under their respective trades. I have used a similar table for several years to assist me in estimating probable power consumptions and in practically every case the figures have been subsequently proved to be substantially correct.

Factories and workshops requiring from 70 to 100 h.p. are indicated in the table by asterisks, and the average consumption of these may be taken as about 589 kWh per annum per h.p. installed. In such a case the cost of electricity, at 1½d. per kWh, would be only £3 1s. 4d. per annum per h.p. installed, instead of the maximum possible figure of £10 19s. 4½d. mentioned earlier. In these works the

Enclosed-ventilated type 25-h.p. Motor for Operating a 50-in Wood Planer

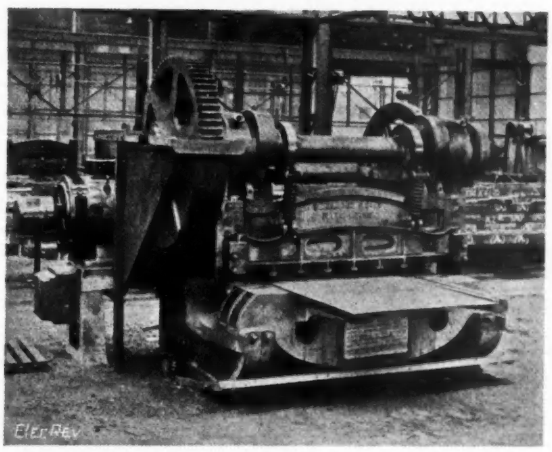
average proportion of actual to maximum possible kWh is about 28 per cent. It must be remembered that these are *actual* cases of normal factories under ordinary trade conditions.

It is usual in a factory of the size dealt with in this article for one oil engine only to be employed, with a multiplicity of belt drives, from engine to shafting, shafting to machines, floor to floor, and perhaps from building to building. The power taken to drive the shafting and belting alone may be as much as half the total power of the engine where ordinary journal bearings are used. This heavy transmission loss is practically constant throughout the whole day, and will still continue if a portion of the factory is required to work overtime, in contrast to the case with the electric drive where separate machines or groups of machines can be driven by separate small-power motors, with a minimum, or complete elimination, of counter shafts and belting.

Fluctuations of Load

The load on each machine may fluctuate, from no load or quarter load to full load or more, many times per minute. The appearance of the "swarf" from a lathe, for instance, shows that the stress on the tool is not due to one continuous cut but is a series of rapidly fluctuating stresses.

The electric motor, being inherently automatic, instan-



Guillotine Shears in Shipbuilding Yard, driven by 55-h.p. Motor

taneously takes full advantage in energy consumption of any fluctuation no matter how rapid, but with reciprocating engines, however well governed, some time lag is inevitable, and they cannot take any advantage of rapid fluctuations.

It is difficult to convince a layman that, in a factory driven by an electric motor, the average horse power to be paid for

Trade.	kWh per ann. per h.p. installed.	Percentage of actual max. possible kWh per ann. per h.p. installed.	Trade.	kWh per ann. per h.p. installed.	Percentage of actual max. possible kWh per ann. per h.p. installed.
Acetylene mfrs. (dissolved) ..	*430	20.4	Glass mfrs. ..	*470	22.3
Aircraft mfrs. ..	*990	47	Gun makers ..	667	31.7
Asphalt	*284	13.5	Iron founders ..	*781	37.1
Bakers, confectioners	390	18.5	Jewel - case makers	893	42.4
Basket makers..	558	26.5	Jewellers (mfrs.)	*775	36.8
Bedding mfrs. ..	*432	20.5	Joinery	*282	13.3
Bedstead mfrs...	*613	29.1	Laundries	*746	35.4
Blind mfrs. ..	114	5.42	Leather workers	*730	34.7
Boat builders ..	143	6.8	Margarine mfrs.	*719	34.15
Boiler makers ..	*200	9.5	Meat co.'s (cold storage).. ..	654	31.1
Boot makers ..	*570	27.1	Monumental masons	*558	26.5
Brass founders..	*927	44	Mineral - water mfrs.	363	17.25
Brewers	*524	24.9	Motor car engrs.	*636	30.2
Brick makers ..	203	9.64	Motor - radiator mfrs.	*606	28.8
Brush mfrs. ..	*364	17.3	Motor - tyre specialists ..	864	41.05
Builders	230	10.92	Opticians	354	16.8
Builders merchants	104	4.4	Paint mfrs. ..	*514	24.4
Butchers	278	13.2	Paper-box mfrs.	*366	17.4
Button mfrs. ..	*570	27.1	Polishers	*744	35.35
Chocolate mfrs.	285	13.5	Printers	*427	20.3
Clothiers	938	44.55	Public lifts ..	352	16.72
Coach builders	299	14.2	Rolling mills ..	*486	23.1
Coal merchants (wharfs) ..	*170	8.08	Sausage mfrs. ..	758	36
Concrete mfrs. ..	*361	17.15	Shipbuilders ..	975	46.3
Dairymen	910	43.2	Stampers and piercers	*592	28.1
Die sinkers ..	188	8.93	Steel mfrs. ..	127	6.2
Dyers & cleaners	*986	46.8	Timber merchants	208	9.93
Electroplaters ..	*546	25.9	Wire workers ..	*1,091	51.8
Engineers (general) ..	*628	29.8	Yacht builders..	195	9.26
Fertilisers & oil-cake makers ..	*918	43.6			
Fried-fish shops	247	11.74			

* Installations of from 70 to 100 h.p.

is only about 28 per cent. of the total horse-power installed, while in the factory which is driven by a reciprocating engine the average horse-power to be paid for is a far higher proportion, possibly as much as 75 per cent.

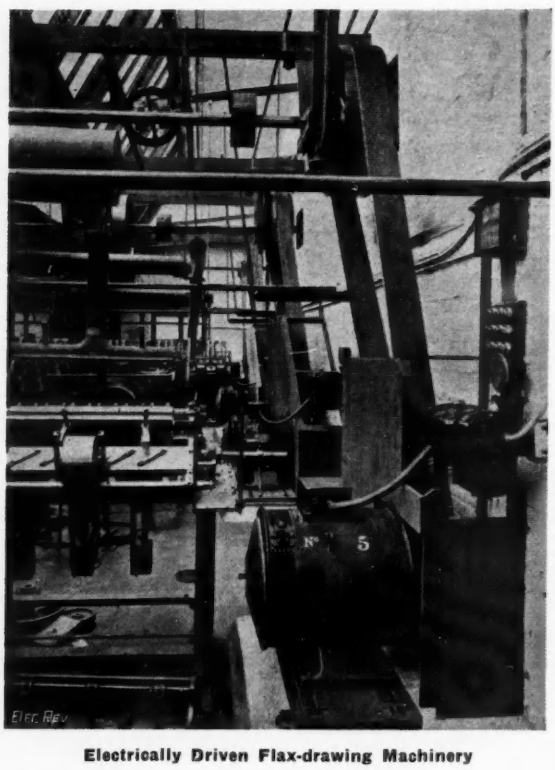
Manufacturers will guarantee the following relative percentages of full load efficiencies for motors of medium size: ¾ load,

99; ¾ load, 96; ½ load, 88; and a no-load loss of 5 per cent. of full load.

These efficiencies may be compared with the relative figures available for a 70-h.p. oil engine, *viz.*, ¾ load, 95; ½ load, 84; ¼ load, 62; and a no-load loss of 38.5 per cent. of full load.

Even if it were possible for the average load on the oil engine to be as low as 28 per cent. of full load, the relative percentages of full load efficiencies would be: for the electric drive 90 per cent., and for the oil engine 65 per cent.

Now the consumption figures already given for the oil engine, *i.e.*, 0.5 lb. of fuel per b.h.p. hour are for full load. If the relative efficiency of the oil engine at the average load in



Electrically Driven Flax-drawing Machinery

point is only 65 per cent. then the consumption will be increased to 0.77 lb. per b.h.p. hour. These figures are theoretical, however.

In dealing with the electric drive the author has used practical data only; the same consideration must be given to the oil engine. For this purpose information has been obtained that in an average factory a 70-h.p. oil engine will consume about 30 tons of fuel oil per annum of 2,400 working hours.

The above comparison shows that while the annual consumption cost per horse-power installed can be reduced to £3 1s. 4d. in the case of the electric drive, the fuel cost, in the case of the oil engine, will be not less than £1 16s. 5d. per annum per horse-power installed. Consumption cost is only one item in the total annual cost, however. With an electric drive it is the main item, while in the case of the oil engine it is only a small proportion of the whole.

Comparative Costs of Electricity and Oil

Assuming a factory requires 70 h.p. to drive it, the total capital cost of the electric motors, complete with pulleys, starters, and slide rails will probably be as under:—

Two 20-h.p. motors (1,500-r.p.m., high-torque a.c. three-phase), £58 6s. 6d.
Two 10-h.p. motors (1,500-r.p.m., squirrel-cage three-phase), £33 11s.
Two 5-h.p. motors (1,500-r.p.m., squirrel-cage three-phase), £24 17s. 6d.
Foundations wiring and fixing, complete, £100.
Total capital outlay, £216 15s.
Annual cost for 20 years' life at 5 per cent. interest and 3½ per cent. sinking fund, £18.

A 70-h.p. oil engine, installed complete with oil and water tanks, lubricating oil reservoirs, foundations, &c., will cost not less than £1,250. This money will usually be borrowed on a fifteen years' life; therefore the annual cost at 5 per cent. interest and 3½ per cent. sinking fund will be £127 5s. 6d. Thus the annual capital cost of the oil engine is £109 5s. 6d. more than that of the electric drive, quite apart from the fact that an extra £1,033 of the owner's capital is being sunk in machinery which has a comparatively low second-hand market value.

The cost of lubricating a ball and roller bearing electric motor is negligible, whilst the annual cost of lubricating oil for the engine has been given as more than one-seventh of the total annual cost of fuel oil.

The oil engine requires the attendance of a skilled mechanic and, even though he may also be employed in other directions, a considerable portion of his wages must be allocated to the engine and the shafting and belts.

The annual costs of driving the factory by means of an oil engine and alternatively by electric power, covering only the main items—consumption, lubrication, interest, depreciation, and attendance, will be as under:—

Oil Engine.	£	s.	d.	Electric Drive.	£	s.	d.
Consumption	127	10	0	Consumption	210	10	0
Lubricating oil	18	4	3	Lubrication	0	2	0
Interest and depreciation	127	5	6	Interest and depreciation..	18	0	0
Proportion of wages	100	0	0	Attendance (cleaning) ..	5	0	0
	£372	19	9		£233	12	0

Such items as repairs, starting facilities, lighting, and insurance have yet to be considered.

The reliability of electric motors is such that, with periodical inspection and cleaning, breakdowns are very rare. Should a breakdown occur, replacement with a spare motor (hired for the time being from a local contractor or the supply undertaking) is merely a matter of hours, whilst the only machinery affected will be that driven by the defective motor. Reciprocating engines, on the other hand, consisting of many parts which undergo repeated and rapidly alternating stresses, need considerable replacements after a few years' use, and the whole works may be at a standstill whilst spares are being obtained and fitted.

Starting up an oil engine on a cold morning, when the oil in all the bearings and round the piston is semi-solid, may entail a number of workers standing by whilst the mechanic gets the machinery running.

As business expands, the factory will increase in size and the owner must therefore look well ahead and provide at the outset an oil engine large enough to cope with future requirements. This would entail a greater capital cost and a decreased working efficiency. Alternatively, he must sell his engine at some later date at its much reduced second-hand value and purchase a larger one. With the electric drive, however, extra motors can be added where required, and the rest of the works will not be adversely affected. The space taken up by the oil engine, pipe lines, storage tank, water tank, &c., is valuable, whereas electric motors can be placed in odd corners or on the super-structure out of the way, as may be seen from the accompanying illustrations of typical drives, carried out by the English Electric Co., Ltd. Further illustrations of electrically-driven factories, lent by the British Electrical Development Association, appear on the next page.

The Factory Lighting Load

The lighting load comes on for only a few hours per night during the winter months. If it is intended that the oil-engine drive shall be used throughout, a dynamo and switchgear must be purchased to provide the electricity, and the size of the oil engine must accordingly be increased. The capital charges to be allocated to each hour of running are thus very heavy, while the average efficiency throughout the daylight hours will be proportionately smaller. Furthermore, the oil engine must be kept running (with attendance) if a few lights should be required in the office after factory hours. Some makes of hot-bulb engines require an appreciable amount of load to keep the bulb sufficiently hot to fire the charge. The installation of a secondary battery to cope with the occasional lighting would entail an increase in capital cost and a corresponding decrease in efficiency.

The insurance premium is more for an oil engine than for electric motors, in view of the larger cover.

Last, but by no means least, comes the question of cleanliness. Factory managers now realise that clean and healthy working conditions play no little part in the general efficiency of production and have a marked effect upon the psychology of the operatives.

Electrical Association for Women

The arrangements of the Liverpool and District branch for this week included a lecture by Prof. E. W. Marchant, D.Sc., on "Electricity at Home,' on October 5th, and a visit to Blackpool by motor coach to see the illuminations yesterday (Thursday).

Future activities of the branch include a lecture on October 19th by Miss Simonson at 24, Hatton Garden, Liverpool, on "The History and Development of the Telephone."

Engineering Trade in China

By Prof. C. A. MIDDLETON SMITH, M.Sc., M.I.Mech.E., of the University of Hong Kong.

A Method of Encouraging British Exports

"WHEN you are in England"—said my friend, who is an electrical engineer in China—"when you are in England do beg our chairman to send out one of the directors of the company to China. Let one of the board come out here and see for himself. If he does come he will appreciate Far Eastern conditions. We shall then get more practical help from the financial and manufacturing side of our organisation."

Having discharged this not very easy duty, it now seems only fair to explain to other British electrical manufacturers why they should consider seriously an investigation of the market for their goods in the Far East.

Currency Problems

It is now realised that the slump in the price of silver was a very big factor in the recent decline in the value of exports from Great Britain. With these problems of currency and high finance the ordinary engineer is bewildered and exasperated. His whole life-work centres around the word "efficiency." How can there be efficiency when there are these violent fluctuations in values?

Let us take actual figures concerning the value, in English currency, of the (silver) dollar in use in the British Crown Colony of Hong Kong. Incidentally, it may be mentioned that the currency all over China is on a silver basis. It has never the same sterling value in any two places; which is another factor in the problems involved in sending machinery into China.

To return to a consideration of the value of the Hong Kong (silver) dollar. Twenty years ago, when the writer first heard of it, the value was about 2s. 1d. At the outbreak of War (1914) the value began to fall—it reached about 1s. 7d. Then it began to rise. During the War it remained, for some time, at about 3s. 4d. In 1920 it went up to 6s. 3d. In 1921 it had fallen below 2s. 6d. Some few months ago it was about 10½d. Ten days ago it was 11¼d., and to-day it is 1s. 3d.

These figures may not be accurate exactly, but they are a fair representation of the state of affairs. The rate of exchange in China, or in Hong Kong, varies from hour to hour. The main factor is the price of silver, but other causes have an influence.

Friction in Trade

All of these fluctuations in currency may, or may not, benefit some people. They offer a great temptation to gamble. The Chinese certainly do like a "flutter." The scientist may indulge in roulette or chemin-de-fer as a recreation, but the trading engineer will not readily gamble for his livelihood. He thoroughly dislikes this sudden alteration in the relative value of the currencies of his own country and that of the Far East.

It is simply friction in the machinery of commerce. It seems to him that the people who design and run the machinery should be intelligent enough greatly to reduce this friction. In his exasperation he blames them for the troubles

Shanghai—a Gateway of China

which beset him. The progress of applied science has been so rapid that the economists have been unable to adjust distribution to mass production. But even with currency "friction," Britain must export goods or starve.

The New Civilisation

It was the writer's privilege to take part in the Faraday centenary celebrations as a delegate appointed by the University of Hong Kong. Many distinguished men, including politicians, paid sincere tributes to the work of the Father of the electrical industry. During the week we heard of, and we read about, the amazing developments of applied science during the century that is past. Are we at the commencement of a new era in the science of distribution? We need a Faraday of finance.

As the visitor from Hong Kong at the Royal Albert Hall looked at the impressive statue of the great man with the mid-Victorian costume, and then glanced at the factory-like interior of the B.B.C. transmitting section, he wondered: "What will happen in the next decade?" It all depends on the British people. They lead!

The Awakening of Asia

A few months ago a speaker from a British broadcasting station said that the greatest event of this century was not the Great War, but the awakening of Asia. Many of us who have travelled in Asia agree.

The rattle of the power-hammer and the hum of the airplane is to be heard to-day in the cities of China. Young Chinese are crowding the cinemas in the coast-ports of Shanghai, Tientsin, Amoy, Hong Kong, and other places. They listen to the English and American languages. They see the lovers and the lingerie, the crooks and the crimes, on the screen that attracts and fascinates.

Modern factories are springing up in China. The approach up the river to Shanghai reminds one of the journey up the Thames to London.

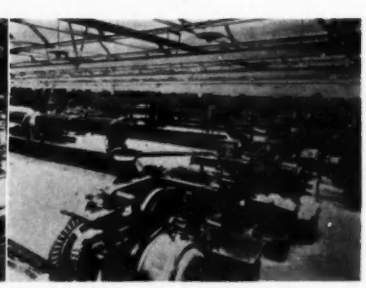
More than any other people, the British, by their inventions and trading enterprise, have been responsible for these great changes in China.

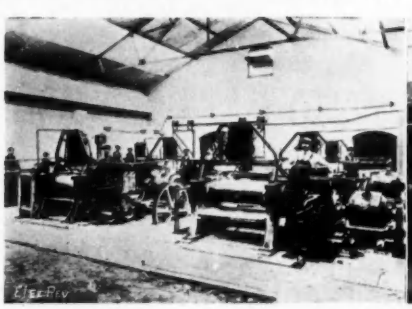
Is it possible so to organise that we can greatly increase the engineering trade between Britain and China?

The Latest Mission

A few months ago the British Government sent out an economic mission to the Far East. The writer met many of the members, attended official functions, gave evidence, and prepared a lengthy memorandum.

It was simply astounding that only one representative of the engineering industry was included in that mission. It was encouraging to hear non-technical men of the mission agree that the great market of the present and the future in China is for machinery of all kinds. Lancashire and Yorkshire must realise that there have been recently great changes in





The Electric Drive in Factories (see preceding pages): (Above) Two views of some mills as they looked before electrification and as they appear now that the electric drive has been installed. It will be seen that by the conversion a great deal of shafting and belting has been dispensed with. (Right) Illustrating the use of the individual drive in a rolling mill, and electrical driving plant in a rubber works

China. Factories, steam, and water-power developments, communications, &c., have ushered in the new industrial era. The market of the future is machinery rather than piece goods. The new civilisation has come to China.

Like some active chemical reagent, it is eating away the old national habits. The Chinese on his farm in the interior may be the same as his predecessor of the days of Confucius; but the educated Chinese who mingles with foreigners and who makes a better public speech in the English language than can most of his English friends—he is very different.

A Practical Problem

Every Englishman in the Far East talks of England as "home." Every one of us wants to help the land that gave us birth and our ideals.

We know full well the prominent national trait so noticeable in England, the dislike of any change. And yet Englishmen, such as Faraday, have created changes that have altered everything in our lives.

For nearly twenty years the writer, in the ELECTRICAL REVIEW and on many platforms, has begged industrial engineers to train young Chinese engineering graduates in their works to become their agents in China.

When Colonel Morcom arrived in Hong Kong, a member of the British Economic Mission, he was pounced upon with this demand. No doubt he was worried and harassed by all those other problems of currency, trade commissioners, etc., but here was something definite. He was introduced to Chinese graduates in engineering. He was told of those who wanted to spend a year, or two years, in British works. Most emphatically he was told that the scheme desired was that some British organisation, such as the B.E.A.M.A., or the British Engineers' Association, should formulate definite and uniform terms for the admission of Chinese graduates into British works. They could help British export trade if only they would help forward this schedule.

Young Chinese Salesmen

It surely must stand to reason that the best salesmen for British engineering products in China is a modern-educated young Chinese, who has made contact, for two years or so, with the organisation for which he works. He knows the language and the psychology of his own people, and he can influence his personal friends as no foreigner can.

This does not mean that firms will not employ British engineers in China. For many years to come it will be essential that there should be British engineers to supervise and to direct. They need to be assisted by young Chinese, with experience of the "home" organisation. These young men will travel and secure orders that no foreigner could obtain.

From time to time we have succeeded in getting an engineering graduate into some works in Britain. It has been an irritating business, involving much correspondence and delay. Frequently the young Chinese, on whose behalf we have worked, has become impatient and has gone off to the United States, where he has been sure of a welcome.

It is, of course, no part of the duty of any member of the staff of a University to find positions in life for graduates. The British manufacturer may easily retort, to the plea advanced above, "Mind your own business!" To that there is only one reply. Emerson said of the English, "They have a wonderful heat in the pursuit of a public aim." And again, the reader may be reminded of an English characteristic. "To show capacity," a Frenchman described as the purpose of a speech in debate; "No," said an Englishman, "but to set your shoulder to the wheel—to advance the business."

It seems that it really is the business of every Englishman to-day to do his utmost, however insignificant his effort may be, to stimulate the flow of British goods to foreign lands.

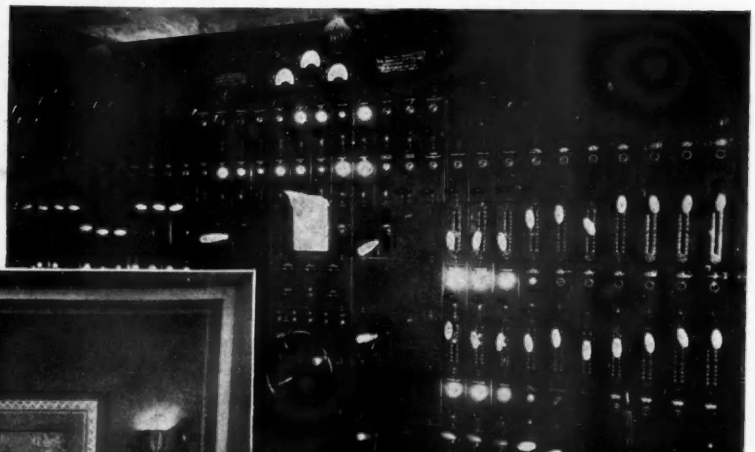
L'Envoi

There is the plea—advanced not for the first time. It will be reiterated until it is accepted. In a material sense it makes not the slightest difference to the writer whether an engineering graduate in China sells goods made in Britain, Belgium, America, or Scandinavia. But that other sense—that intangible reaction that makes us exiles in China call England "home"—that is more important than any desire for comfort or peace. For we believe that the whole future of civilisation depends on the increase in the export trade of Britain. We cannot remain indifferent when we know that we can help. We shall worry British manufacturers until at last they act. "May it be soon" is our fervent hope.

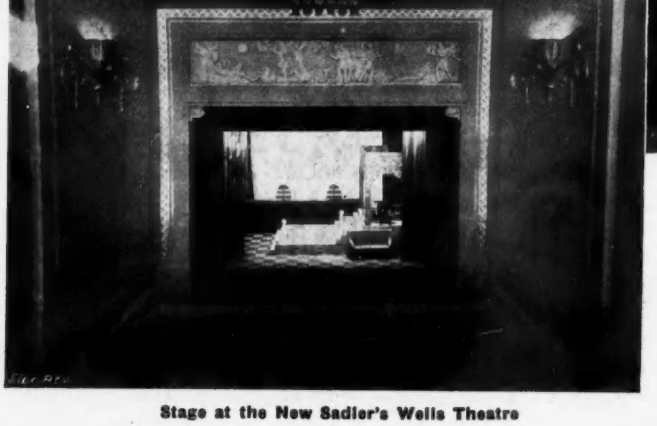
The New Sadler's Wells Theatre

Outstanding Electrical Features

THERE are several unique features in the electrical installation at the new Sadler's Wells Theatre. It is a brick-built building of simple and imposing lines which are realised to the full owing to its practically island site. The auditorium seats 1,600 persons, and the "gods" offers grand opera and tip-up seats at 6d. The stage is spacious and is so designed that the scenery from the Old Vic can be used. The lighting, as indicated here, is particularly effective and pleasing. Over the proscenium is a finely modelled relief showing a scene from "A Midsummer Night's Dream." Nearly 23,000 yards of Henley v.i.r. wire were used for the lighting installation, which was carried out by the Berkeley Electrical Engineering Co., Ltd., 6,000 yards being used on the switchboard alone. This board is one of the outstanding features of the installation; it controls the whole of the lights—stage and house—and it is so arranged as to be workable by one man who, by suitable setting, can dim all the house lights and throw up the stage lights by turning a master handle. Many combinations of colour lighting can be obtained on the stage by the batten lights, on the largest of which 4,500 yards of cable were used.



The Selective Switchboard



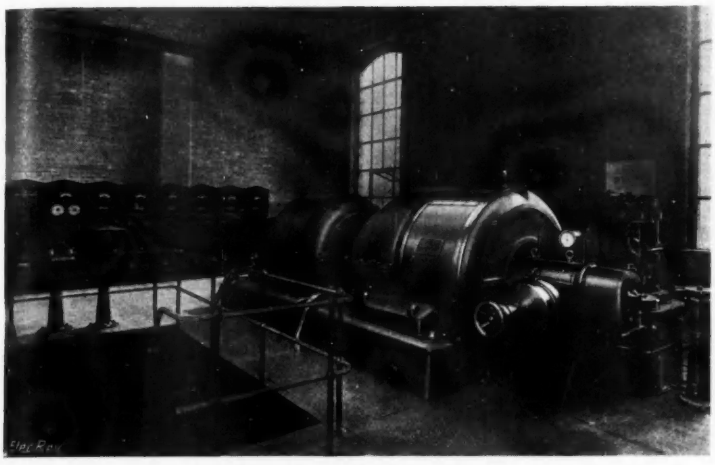
Stage at the New Sadler's Wells Theatre

Shakespeare has now two permanent homes in London, and Clerkenwell may well become famous again as in the days of Samuel Phelps.

Colliery Electrical Plant

A new central steam and electric power generating plant, as well as a by-product coking installation, are features of the new Brookhouse Colliery

BROOKHOUSE Colliery is the latest development of the Sheffield Coal Co. at Beighton, near Sheffield, which is being laid out for a weekly output of 15,000 tons of coal. The sinking of the 18-ft.-diameter shaft has been completed, and when fully equipped the colliery will be representative of the most modern mining practice.



Interior View of the Power House

The electrical system is linked with the company's Aston, Beighton, and Birley East collieries. The new installation includes, in addition to the power-house plant, a Ward-Leonard controlled winding engine, transformers for general distribution purposes, and motors for driving the coke-handling and screening plant. The contract for the whole of this equipment was placed with the General Electric Co., Ltd.

The coke-handling and screening plant was manufactured at the Fraser & Chalmers engineering works (in accordance with the Robins system) as sub-contractors to Simon-Carves, Ltd., who were responsible for the new coke-oven plant installed at the colliery. Steam for the coke ovens and turbine is supplied by two Simon-Carves 30,000/40,000-lb.-per-hour multiple-drum boilers fired with pulverised fuel; provision has been made for firing these boilers with surplus coke-oven gas, either alone or in conjunction with pulverised fuel.

The electric power house is grouped with the main power and powdered-fuel boiler plant for the colliery and coke ovens. The turbo-alternator is of the G.E.C.-Fraser & Chalmers standard directly coupled type with a maximum output of 2,500 kVA at 3,000 r.p.m., 3,300-volt, 3-phase, 50-cycle. The turbine is of the multi-stage impulse type for a steam pressure of 200 lb. per sq. in at 200°F. superheat and 28-in. vacuum. The set is arranged for working in parallel with existing power plant at the Beighton and Birley East collieries. The main switchboard is of the truck type, consists of eight panels, and is equipped with a Tirrel regulator.

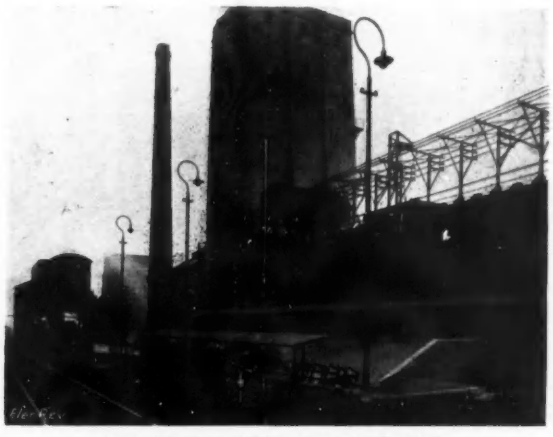
The switchboard in the winding house is also of the truck cubicle pattern with five panels. The winding plant will raise a net load of 15,676 lb. of coal from a depth of 1,350 feet with an output of 196 tons per hour. The winding drum is directly coupled to the d.c. driving motor, which is rated at 1,150/2,700 h.p. at a speed of 43.5 r.p.m. The motor is fed with direct current by the flywheel motor-generator set, which is an 800-kW d.c. generator of the open compensated type driven by a 900-h.p. induction motor supplied from the 3,300-volt mains. A smaller exciter is also directly coupled to the set, the normal speed of which is 1,000 r.p.m.; at this speed the energy stored in the flywheel at full speed is 45,000 h.p.-seconds, and it is given up at peak loads with a speed reduction of 20 per cent.—*i.e.*, down to 800 r.p.m. This is effected by a liquid slip regulator in the rotor of the induction motor, which is actuated by a torque motor energised through a current transformer on the stator circuit. This slip regulator is designed to act as a starter for the motor generator set.

In the design of the winding engine the distribution of the rope on the drum was determined with a view to making the power demand as even as possible; the actual load curves are given on page 532.

The winding drum has a small diameter of 11 ft. and a large diameter of 17 ft. 6 in. with three live coils on the smaller diameter, five on the cone, and 18.6 on the large diameter.

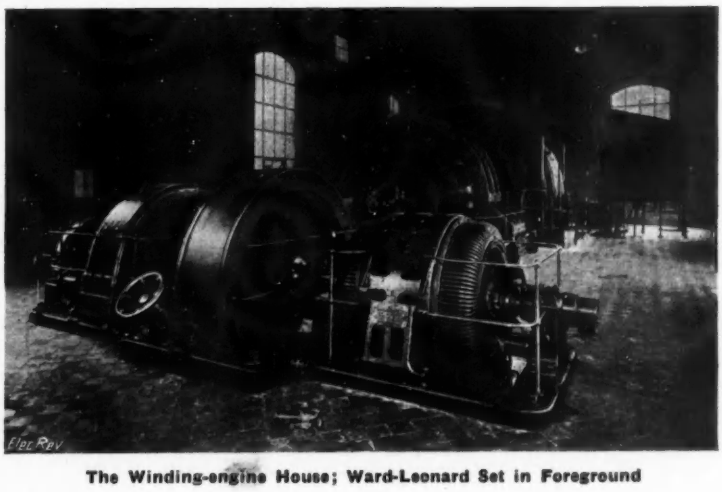
The brakes are of the conventional straight-post type operated from an air brake engine controlled on the Iversen principle. The principle of this engine is that the air is supplied through a variable-pressure reducing valve, which is controlled from the operator's lever to give the variation in pressure. It is so arranged that the air pressure in the brake engine cylinder corresponds exactly to the position of the operator's lever; the brake force is therefore independent of the wear on the brake blocks. The acceleration and deceleration of the winder is controlled by cams geared to the drum shaft and arranged to act upon the driver's hand lever gear.

The supply for the generator and motor fields is derived from the exciter which is directly coupled to the motor generator set. An emergency stop switch, mounted at the driving platform, is arranged to trip the main contactor in the exciter circuit, and this cuts off all power excitation from the winder, at the same time putting on the brake.



Coke Ovens and Conveyors to Screens

As the d.c. circuit is always closed, it is necessary to provide "suicide" contactors to prevent the residual magnetism in the generator field system from building up sufficient volts



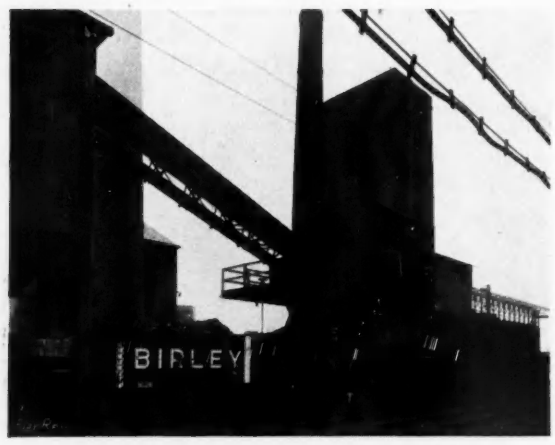
The Winding-engine House; Ward-Leonard Set in Foreground

to cause heavy circulating currents in the stationary motor armature. These contactors are always in the " suicide " position when the control lever is in the " off " position, and only move to the running position when the preceding operations have taken place in correct sequence. When the controller is in the " off " position an economy resistance is introduced into the motor field to cut down standing losses.

As regards safety devices, the winder has the usual limit switches, which are opened upon excessive travel of the cages; the exciter and brake contactor are tripped, bringing the winder to rest by means of the emergency brake set, with the " suicide " connection made.

To ensure a quick suppression of the machine fields on tripping of the excitation contactor, the latter, when de-energised, short circuits the exciter through a low resistance, and so quickly reduces the exciter field current. After an over-wind the corresponding back-out switch on the controller must be closed before power can be obtained to back out of the over-wind; this switch is automatically re-opened on the first motion of the controller in the direction of the over-wind. As the exciter is shorted through a low resistance, the exciter will not " build up " until this short circuit has been removed by operating the spring-biased re-setting switch. This removes the short circuit until the exciter builds up and closes the exciter contactor again, this being indicated by the lighting of a pilot lamp.

In addition to the emergency stop switch and over-wind switches already mentioned, the following safety features act upon the exciter contact either directly or through the medium of an auxiliary tripping relay: (1) a brake by-pass switch which ensures that the driver's brake must be on before the emergency brake can be lifted; (2) air pressure relay in brake system; (3) winder overspeed switch; (4) motor-generator overspeed switch; (5) main overload relay; (6) a speed relay in conjunction with the magneto-generator which supplies the driver's speed indicator is arranged to energise a relay which rings a bell in the event of the winder's speed rising or falling outside certain limits at any point during the wind.



Belt Conveyors from Coke Wharves to Screens

The safety devices also include a new type of over-winding device, which incorporates the " Whitmore landing zone controller," and gives protection against approaching the bank level at too fast a speed. The principle of operation is that the speed of the winder must conform to a predetermined value, which is fixed by the rate of fall of a plunger in a hydraulic cylinder; if the speed of the winder does not decrease at the same rate a trip operates the emergency gear.

A general idea of the coke-handling and screening plant may be obtained from the accompanying illustrations. Coke is pushed from the ovens on to a hot coke car, being quenched and then discharged on to a coke wharf, from which it is delivered through a series of hinged finger gates on to a belt conveyor arranged alongside the wharf, and ultimately delivered into wagons and classification bins via primary and secondary screening stations. The aggregate capacity of the plant is at the rate of 50 tons per hour, the maximum size of coke dealt with being from 12 in. to 14 in. and ranging down to smalls.

The wharf conveyor is arranged in a suitable position in relation to the lip of the coke wharf. The finger gates, of which there are nineteen in number, are operated from a platform placed above the conveyor and opposite to the wharf in such a position that the operator has a full view of the distribution of coke on the wharf, is able easily to regulate the flow of coke on to the belt, and at the same time to detect any hot spots which require additional quenching before being allowed to flow on to the belt. This wharf conveyor carries the quenched coke up an incline into the top floor of the primary screen house, where it is delivered over a rotary grizzly screen which separates all under 2½ in., the overs being delivered on to a cross-conveyor and boom loading conveyor direct into the trucks.

The throughs from the rotary grizzly flow into a hopper underneath, whence they are delivered on to a belt conveyor which elevates and delivers the small coke into a secondary screening house, where it is further sub-divided into four distinct classifications and delivered into separate bins by means of two Robins vibrating screens.

The classifications into which the small coke is divided are ¾ in. to 1½ in., 1½ in. to 2½ in., ⅜ in. to ¾ in., and 0 to ⅜ in., and these are discharged into wagons underneath, as required,

Point of Delivery to Belt Conveyor

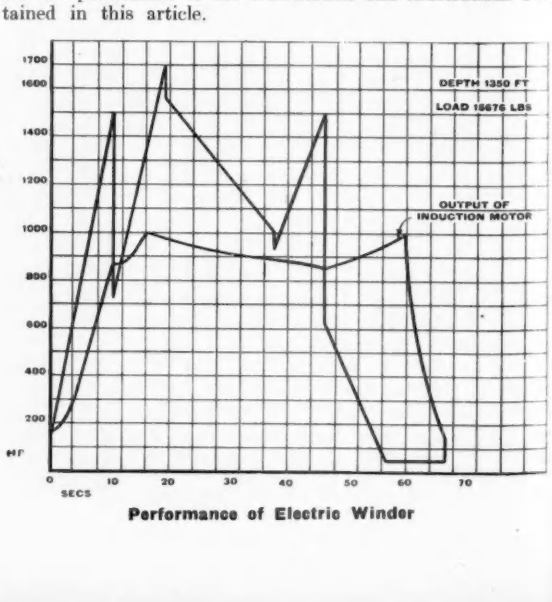
through suitably operated radial gates fixed to the outlets of the bins.

Arranged in the primary screen house under the head of the wharf conveyor is a rotary coke cutter, capable of cutting coke at the rate of 30 tons per hour and reducing from a maximum of 12 in. down to 1½ in. Coke from the wharf conveyor may be by-passed to this coke cutter by removing one or more adjustable plates, which are arranged between the head of the conveyor and the rotary grizzly. These plates allow various capacities up to a maximum of 30 tons per hour to be fed to the cutter. The coke which has been passed through the cutter is delivered on to the small coke conveyor and carried to the secondary screening plant in the manner as described above in the case of the throughs from the grizzly.

The plant throughout is electrically driven, the motors (of the frame-cooled type) and the motor control gear being entirely of G.E.C. manufacture. Should any portion of the plant break down, the operator can bring the remainder automatically to rest by the operation of a push button.

The conveyors and screens are all mounted and carried on steel framework provided with adequate walkways, stairs, ladders, and access platforms. The screen houses are arranged over the centres of the railway tracks in such a manner that trucks can be run through between the columns supporting the buildings and shunted into position for filling from the various discharge points.

In conclusion, acknowledgment is made to the directors of the Sheffield Coal Co., Ltd., for their permission for the publication of the information and illustrations contained in this article.



Performance of Electric Winder

Illuminating Engineering. By G. H. Wilson and J. M. Waldram

Recent international agreements and lines along which future work can most profitably be undertaken

FOLLOWING their twelve days' tour of some of the principal cities in England and Scotland, delegates attending the first International Illumination Congress to be held in this country assembled at Cambridge for the eighth plenary session of the International Commission on Illumination. According to the principle laid down at its last session at Saranac Inn, N.Y., U.S.A., in 1928, business was confined to the discussion of the various subjects under review with a view to reaching international agreement whenever possible and of laying down the lines along which further work could most profitably be undertaken. National Committees in each affiliated country study each subject, and one National Committee acting as the secretariat in a subject undertakes the preparation of a Secretariat Report recording the progress which has been made in all countries, and when possible suggesting lines of possible agreement or future work.

Great Britain had the honour of providing the president in the person of Mr. C. C. Paterson, who has held office for the second time in succession, and also the honorary and the general secretaries in Dr. J. W. T. Walsh and Dr. W. S. Stiles, for the secretarial side of the Commission has long been handled by the National Physical Laboratory.

Fifteen countries are now members of the Commission, Argentina, Czecho-Slovakia, Hungary, and Poland having joined since the last plenary session.

Aviation Lighting

Two technical sessions were necessary for this important subject. The Secretariat Report, presented by the American Committee, first gave the replies to an international questionnaire, and a fully illustrated description of aviation lighting practice in the United States. Then consideration was given to the resolutions of a special meeting of the aviation committees held in Berlin eighteen months ago, and a considerable measure of international agreement was reached on the following lines. First, a set of definitions of terms was drawn up and agreed to, so that it is now possible to refer to any piece of aviation lighting equipment by either a French, German, or an English word, with the full knowledge that it will be understood internationally.

In an attempt to standardise the characteristics of certain lights it was agreed that the boundary lights indicating the limits of the landing area at an aerodrome must be distinguishable from the lights placed on obstructions. The latter, it was agreed unanimously, must be red in colour and so far as is possible fixed; a special colour, easily distinguishable from red, is to be developed for boundary lights (the British delegates strongly favoured orange, but agreement could not be reached). Beacons were also discussed, the most important decision being probably that airway beacons must all be of the same kind along any one route and must be placed as closely as possible to the exact line of the route.

With regard to lighting on aircraft, a plea was put forward for a maximum of standardisation of the voltages used, in order that the stocking of lamps and spares at aerodromes might be made as simple as possible. It was agreed that 6, 12, and 24 volts should be recommended for adoption as standard voltages, and national committees have been asked to study the possibility of arriving at one agreed pattern of cap for all the lamps up to 60 watts consumption used on aircraft. An important question of principle has been raised by the recommendation that the I.C.I. should request the Commission Internationale de Navigation Aerienne to consider so modifying its regulations that the intensity of a navigation light in any direction shall be proportional to the danger of collision in that direction. The Commission is also recommending that the performance of navigation lights shall be specified in terms of the intensity (candle-power) rather than of range, so that manufacturers will be able to test their equipment for compliance with regulations in the laboratory under controlled conditions and will not have to conduct indefinite tests on range.

Delegates returned with a full programme on aviation lighting, and it is possible that a further meeting will be called before the three years' interval between plenary sessions has elapsed.

Diffusing Glassware

Complete investigation of the simple diffusing globe has long taxed the ingenuity of mathematical and physical investigators. This year two papers were presented from Germany (by Dr. Schönborn and by Dr. Bloch), two from Japan (by Mr. Kurosowa), and three from Great Britain (two by Messrs. Ryde and Cooper and one by Mr. J. S. Preston). The studies of Messrs. Ryde and Cooper at the research laboratories of the G.E.C. have reached a very practical and quite simple conclusion, with the result that it is now possible to calculate for any given glass the total transmission of a globe, made just thick enough to conceal the filament, from the results of a few experimental determinations made upon a sample. A resolution was passed drawing attention to this work and asking National Committees to study the possibilities of using this optimum transmission as a basis of specification of opal glasses.

A paper by Dr. Schönborn (read at Edinburgh) dealt with methods of classifying opal and matt glasses; the proposals involved the determination of a "scattering index," derived from measurements of brightness at specified angles. It was resolved to refer them specifically to National Committees for further study. Careful and complicated work of many investigators appears to be leading to a simple solution of practical value.

Automobile Headlights

The Secretariat Report, summarising data received from various national committees, stated that there had been no radical change in practice in the last three years. There appeared, however, to be general accord in the idea that there should be a passing beam distinct from the driving beam. Considerable discussion took place, and eventually it was possible to arrive at international agreement on certain points. First, that the range of a beam, or beams, should be that distance from the projectors at which an illumination of 1 lux (0.1 foot-candle) is produced on a vertical plane. Secondly, on the assumption that the double beam arrangement is provided, that the driving beam shall produce upon a vertical surface placed 100 m. in front of the car, on the centre line and at a distance above the road surface equal to that of the centre of the headlights, an illumination of not less than 1 lux, or greater than 25 lux.

Street Lighting and Traffic Control

Street lighting is perhaps the most baffling of all the problems of illuminating engineering. Although two well-attended meetings were held for the consideration of this subject under the trilingual chairmanship of Dr. Halbertsma (Holland), there emerged more discussion than international agreement. At the first session many speakers joined in a discussion of the factors influencing visibility, based upon the German Secretariat Report of the answers to a questionnaire drawn up by the American Committee. It was generally agreed that vision by silhouette, promoted by a bright road surface, is probably the most important of the several ways in which objects are distinguished. At the second session consideration was given to the tables of data of actual street-lighting installations collected by the Secretariat Committee, and to the British Standard Specification and the American Highway Code. The exchange of opinion was, however, of great value to the experts concerned, and the usefulness of the discussion is not to be measured by the amount of concrete results to be found in the form of resolutions.

Traffic control is more definite in character and lends itself to international agreement. The British Secretariat Report is a useful record of the regulations in force in each country, and it is gratifying that international agreement was reached upon the relative positions of the colours employed, the minimum diameter of the lenses, and the minimum power of the lamps.

The physiological factors influencing vision, which are the real basis of all illuminating engineering, were among the subjects studied. This section was under the disadvantage that the secretariat, held by the Italian Committee, had been unable to function, but the French Committee stepped into the breach and at short notice MM. Dourgnon and Waguet prepared an able report on the definition and measurement of glare. A good deal of work has been done since the last session, of which the researches of Dr. Stiles at the National Physical Laboratory and observations at the annual meeting of the Association of Public Lighting Engineers are good examples.

Glare

The French Secretariat Report was referred to National Committees as a basis for glare definition to be presented at the next session of the Commission. Discussion also took place upon the discomfort resulting from bright sources, as distinct from the measurable diminution in visual performance. Some investigators felt that the two effects were separable, and the point was recommended as worthy of further study; time effects were similarly treated. As a result of the work of Stiles and Holladay, it was felt that the method of investigation which used the principle of an equivalent back-

ground brightness, was likely to lead to consistent and comparable results, and a resolution was passed requesting that investigations should be so conducted as to be expressible on this basis.

The use of the method of appraising glare suggested by the American Committee in 1928 appears to be increasing. It is based on the ability of the eye to estimate which of two light sources located side by side is the more glaring, the arbitrary standards being tungsten-filament lamps of increasing wattage mounted in frosted-ball globes 6 in. in diameter.

The Lighting of Buildings

The Factory and School Lighting Committee is one of the most important under this heading. The Secretariat Committee's valuable report suggested ranges of illumination values for use in various locations in schools and factories as distinct from the minimum values of the Geneva Code of the I.C.I. The recommended values are not to be regarded as critical (above which all lighting is good) but they are rather the range indicated by economic studies, so far as they are available, and particularly by general experience. The figures given for light on the work in factories range from 50 to 30 lux (5 to 3 foot-candles) where discrimination is not essential, to 1,000 to 150 lux (100 to 15 foot-candles) where minute detail has to be perceived. In a section on the trend of illumination levels in use it is stated that a preliminary experiment suggests that an illumination of 3 to 4 foot-candles is needed to promote and maintain feelings of general well-being and cheerfulness, irrespective of any requirements for visual discrimination, and this would appear to be an important conclusion if justified by further work.

On the subject of kinema lighting the Japanese Committee presented a full paper recommending values of auditorium and screen illumination, based on the examination of eleven kinemas in Japan. Drawings are given of the buildings showing the layout of the seats and the position of the screen, and particulars are supplied of the equipment in use for projecting, screen material, &c. The recommendations were to the effect that the horizontal illumination of the auditorium should be 2 lux (0.2 foot-candle) and the average illumination of the screen 100 lux (10 foot-candles). No other country has studied the problem in the detail which the Japanese have done and so further work will be undertaken in the next three years.

Lighting Fittings

For some years endeavours have been made by the National Committees to arrive at a method of so classifying the light distributed by fittings that all units of similar performance will be described by the same name or number. Three or four suggested methods were presented in Cambridge. The British proposal was based on the British Standard Classification No. 398, which describes units as direct, indirect, semi-direct, &c., and then the light distribution in more detail as narrow, wide, extra-wide, &c., depending on the overall shape of the polar curve of the fitting. The Japanese classified the distributions according to the amount of light flux in various zones, but in the opinion of the British Committee this method would not be understood by the non-technical and an impression of the actual light distribution could only be obtained with difficulty. A German suggestion also used the flux method, but in a rather more simple way and with the additional advantage that the coefficient of utilisation of the fitting could easily be determined. However, there was almost unanimous agreement on the use of the terms direct, semi-direct, &c., and endeavours are now to be made to arrive at common, precise definitions.

Two new subjects were suggested for study: first, the possibility of international standardisation of the dimensions of the necks and flanges of illuminating glassware and, secondly, the possibility of standardising the definition of the beam divergence of a floodlight.

Lighting Education

A questionnaire circulated by the British Committee indicated that in most countries the facilities for education in schools and colleges, with the possible exception of Russia, are somewhat meagre and are increasing but slowly.

The Secretariat Report suggests courses for secondary schools, technical colleges, and architectural schools, and outlines a suitable textbook. The Commission passed a series of resolutions recommending National Committees to foster instruction in such institutions on a proper basis, and suggesting that countries either establish proper lighting colleges on the lines of the Lichttechnisches Institut at Karlsruhe, or else support such institutions in neighbouring countries.

Photometry, Colorimetry, Etc.

A good deal of attention was directed to photometry of high precision, to the maintenance of the international candle and interlaboratory calibration of standard lamps, to colorimetry and heterochromatic photometry, and to the accuracy of portable photometers and test plates for the measurement of illumination.

Papers by Messrs. Dudding, Winch, and Little, dealt with the accuracy of commercial photometry by visual and modern photoelectric methods, the error to be expected being of the order of 1.65 per cent. for visual and 1.2 per cent. for photoelectric methods. Mr. Taylor's paper (presented at Glasgow) on the accuracy of portable photometers is also of importance in view of the B.E.S.A. specification and of the extent to which they are in general use. A large number of photometers were tested exactly as they were used in practice against a standard instrument, and the mean error was found to be about 6 per cent. when filters were not used, and about 13 per cent. when filters were used. Individual errors found, however, amounted to over 35 per cent, but from a study of the problem it is suggested that the maximum error to be permitted in a photometer complying with the specification should be reduced to ± 10 per cent. Care and frequent calibration are called for if instruments are to give readings of this accuracy.

Primary Standard

A paper on a primary standard proposed a white light formed by a black body placed within a carbon resistance furnace and raised to the colour temperature of carbon-filament lamps, or of tungsten-filament lamps of the vacuum or possibly of the gasfilled type. The temperature of this black body, which suffices to define its brightness, is determined by spectro-photometric comparisons with a black body maintained at a standard temperature by immersion in a bath of solidifying palladium. Such a standard could be made to specification and, if found entirely satisfactory and adopted, the unit of candle-power would be independent of the carbon-filament lamps which now serve for the determination of the international candle. During the meetings at Cambridge investigators in this field belonging to the different countries were given an opportunity of meeting together and it is hoped that before long agreed proposals for a primary standard of light will be put forward.

Ultra-violet Illumination

The Dutch report on ultra-violet illumination provided a very full summary of the studies which have been made in this subject. It is pointed out that already artificial sources of light are being employed on an increasingly large scale for hygienic purposes and ray treatment is not necessarily taking the form of irradiation by authorised doctors, but is being used in an unrestricted manner during work or play without special supervision by experts. It is of great importance to establish as soon as possible the standard requirements to be complied with by installations intended for this purpose. The function of the lighting installation of the future will probably be "the preservation of health" and the problem in this work at the present time is that observations and measurements are not easy to obtain. There is one exception, namely, the cure of the infantile disease, rickets, in which conclusive results have been obtained. It has been found also that associated with the anti-rachitic effects is the effect of the production of vitamin D and in fact that irradiation of the skin actually transforms ergosterol into vitamin D by a photochemical process. Data have been collected on the relation of the curative power of the radiation to its wave-length and the most favourable dosage and recommendations are given in the Dutch report. Summarising, the Dutch Committee has come, for the time being, to the following conclusions:—

"(i) In order to adapt artificial light to hygienic requirements we must pay special attention to the spectroscopic waveband 290-310 $m\mu$. In this wave-band the rays should be of such an intensity that their effect is comparable with that of the sun's in this waveband.

"(ii) Light of wave-lengths shorter than those in the solar spectrum should be as weak as possible.

"(iii) The sources of light should be placed in such a position that as little of the light as possible can fall into the eyes."

Final Plenary Session

At the final plenary session of the Commission the resolutions put forward by the various committees were formally approved. The new president will be Dr. Meyer, of the Osram Kommanditgesellschaft (Berlin) and the honorary secretary will be Mr. C. C. Paterson (Britain). The three vice-presidents will be Mr. D. Clayton Sharp (U.S.A.), M. de la Paulle (Belgium), and Dr. N. Halbertsma (Holland), and on the invitation of the German National Committee it was decided to hold the next meeting in 1934 in Germany.

Electric Winding Regulation

A hydraulic slip device permitting the use of synchronous motors with flywheel motor-generator sets

THE hydraulic slip regulator recently introduced by the Metropolitan-Vickers Electrical Co., Ltd., makes possible the use of either synchronous or synchronous-induction motors to drive flywheel motor generator sets used with Ward-Leonard winders, thereby giving the advantages of power-factor control that are obtained with motors of these types. The a.c. motor of the set illustrated is of the synchronous-induction type rated at 625 h.p.; the flywheel weighs 10 tons, the rating of the d.c. generator is 625 kW, and the synchronous speed of the whole set is 800 r.p.m.

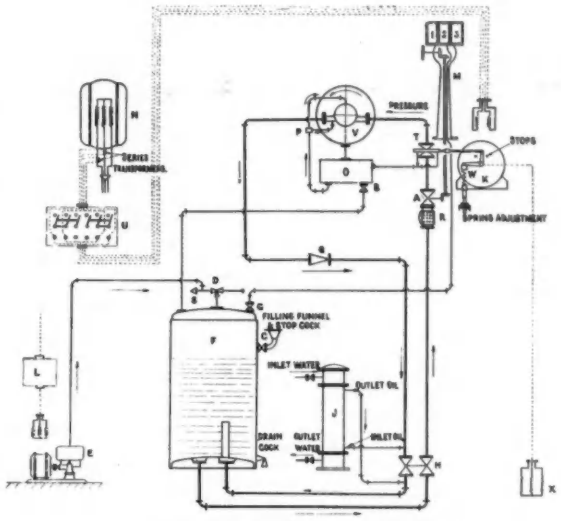
The regulator is inserted between the driving motor and the remainder of the set, so that the former can operate at constant speed and may, therefore, be of the synchronous type of machine. The coupling consists of an impeller and a runner in one casing, the former rigidly coupled to the motor shaft and the latter to the shaft carrying the flywheel and d.c. generator. The coupling is supplied with oil from a pressure tank, and, when full, drives the flywheel and generator on full load at a speed 2 or 3 per cent. below the synchronous speed of the driving motor. When the coupling is empty the flywheel and generator are completely disconnected from the driving motor.

The slip of the coupling is directly proportioned to its filling; therefore, by regulating the supply of oil to the coupling it can be made to slip, and it is this characteristic that is made use of when using the coupling as a slip regulator. The supply of oil to the coupling is passed through a regulating valve T, see drawing, the position of this valve being controlled by a torque motor K, which determines the degree of filling of the coupling as a function of the load on the synchronous motor driving the motor-generator equipment. By this means the load can be equalised to any predetermined value without any change in speed of the motor driving the flywheel motor-generator set.

The oil supply for the coupling is a self-contained closed system, comprising a pressure tank F, sump tank O, valves and piping. The initial charging pressure is obtained by a small motor-driven air compressor E, which raises the pressure in the pressure tank F, to approximately 10 lb. per sq. in. When the coupling is in operation the compressor is shut down, as the necessary pressure is maintained by the pumping action of the coupling itself. The oil piping is connected to the coupling by means of a specially designed gland arranged with labyrinth rings in accordance with M.V. turbine practice, to prevent oil leakage along the shaft. Any oil collected by these rings is returned into a pocket in the gland casting, whence it is drained by gravity into the sump tank O erected immediately underneath the coupling. This sump tank is emptied by means of an ejector P operated by the fall in pressure across the coupling itself. By this means leakage oil accumulating in the sump tank is sucked up by the ejector and delivered to the return piping on the exhaust side of the coupling, and thence into the pressure tank. A hand-operated valve A is supplied for starting and stopping the flow of oil, the operating wheel being fixed on a control pedestal M erected on the engine-room floor and connected to the valve by means of suitable rods and bevel gears.

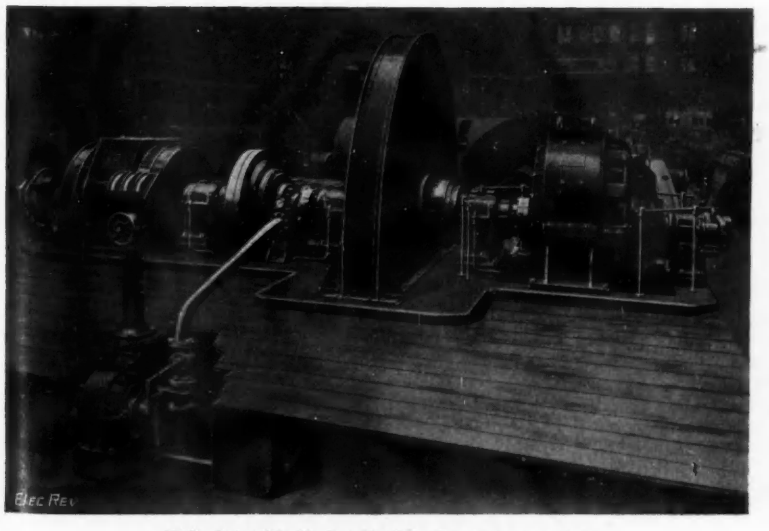
Situated between this valve and the coupling is the regulating valve T, the spindle of which is coupled through suitable levers to a torque motor K and a calibrated spring. Increase or decrease in the tension of this spring respectively raises or lowers the point at which load equalisation is effected. Mounted on the control pedestal M, in addition to the hand-wheel already mentioned, are three meters: a meter calibrated in horse-power, indicating the load on the driving motor; a pressure gauge for measuring the charging pressure in the tank; and a voltmeter calibrated in r.p.m. and indicating the speed of the flywheel and generator.

To prevent flooding if the power is cut off, a valve H is inserted in the pipe, which automatically shuts off the supply of oil to the coupling when the speed of the motor-generator set has fallen to a point at which the pumping effect of the coupling is insufficient to circulate the oil.



Arrangement of Hydraulic Slip Regulator

A, sluice valve; B, drain valve; C, filling funnel; D, three-way cock; E, compressor; F, pressure tank; G, isolating stop valve; H, automatic cut-off valve; J, cooler; K, torque motor; L, compressor switch; M, control column; N, driving motor; O, sump tank; P, ejector; Q, non-return valve; R, oil filter; S, relief valve; T, regulating valve; U, torque motor switch; V, hydraulic coupling; W, regulating spring; X, torque motor resistances. Pipe connections shown thus———; cable connections shown thus .....



M.G. Set with Hydraulic Slip Regulator on Test

The A.S.E.E. Conference

Among the important bodies to arrange a meeting in London to link up with the Faraday commemoration was the Association of Supervising Electrical Engineers, which held its first national conference during the week-end beginning September 26th. The proceedings opened with a meeting between district representatives and secretaries, representing fifteen out of eighteen districts, and the Board of Control at the head office in Russell Square. Mr. J. A. Cowan (chairman, A.S.E.E.) presided, and Mr. A. Brammer (general secretary) addressed the meeting on the subject of provincial organisation. At the conclusion of the morning session a luncheon was held at the National Hotel, at which Mr. S. B. Donkin (president), and Mr. J. Scott Ram (president-elect) met the delegates. In the afternoon a company of about 160 proceeded to the Faraday Exhibition at the Albert Hall, and in the evening, after a visit to the National Radio Exhibition at Olympia, members were entertained by the G.E. Co., Ltd., at the Clarendon Restaurant, Hammersmith, whence they made a motor coach tour to inspect the floodlighting displays.

On Sunday morning a meeting was held at the National Hotel, at which Mr. F. W. Smith (immediate past-chairman) spoke on "The Supervising Electrical Engineer and the World Depression." He said the members of the A.S.E.E., whose salaries ranged between £350 and £1,000 per annum, had been required to bear more than their fair share of the burden, and they were penalised by the new income tax rates.

A resolution was then passed pledging the meeting to use all its influence to encourage the purchase only of goods made in Great Britain. It was also decided to prepare an unemployment benefit scheme.

Electric Iron Design. By C. E. Baxter, A.M.I.Mech.E.

The tendency in development from both the designer's and user's points of view

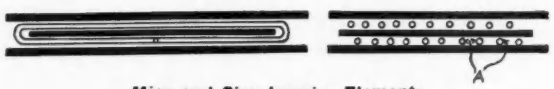
EARLY attempts at electric smoothing-iron manufacture proceeded along the lines of encasing a vitreous-type resistance within the iron body itself, but rapid disintegration of the comparatively poor resistance alloys soon resulted in deterioration and breakdown.

Some success was attained arranging non-deteriorating wire embedded in compound of suitable electrical insulating qualities combined with good heat-conduction propensities, and this led to the use of better resistance alloys and more reliable methods of baking.

One advantage of the embedded type of construction is that the element can be led snakewise over the iron, thus producing an even temperature rise over most of the base itself, and also by a judicious use of the element a greater rise of temperature can be obtained at the toe.

The Main Constructional Problem

The real drawback, however, in producing an element device is that a severe temperature gradient is to be contended



Mica and Circular-wire Elements

with in all electrical insulators which are also arranged for heat conduction. If the resistance could be cast directly in the base there would only be the gradient in this part itself to contend with.

As embedding the resistance in this way is impossible the question resolves itself into producing a combination of the resistance and electrical insulator involving the lowest temperature gradient from the resistance to the body of the iron.

The improved construction ultimately evolved consisted of winding resistance wire of circular section upon a thin piece of mica about 2½ in. by 3 in. laid in the centre of the top face of the iron and insulated from the iron by slightly larger pieces of mica, the whole being clamped between the top slab and the iron base.

Various drawbacks soon manifested themselves here, however, all more or less wrapped up in the heat-gradient problem. The sides of the wire A rose to too high a temperature, due to the heat not being readily conducted away, and the element had to be run at a high temperature in order to produce a reasonable heat at the furthermost points of the iron face, the face itself thus having a severe gradient due to the situation of the heating assembly being more or less at a point in the centre. Most of these problems were easily surmounted, however.

Flat wire was used for the resistance, the configuration of the element as a whole was altered to heat the iron more uniformly, and the top plate and body, between which the element was clamped, were carefully ground flat in order to conduct the heat away evenly. This grinding operation was found to be important as any unevenness caused local heating of the element, producing rapid disintegration similarly to when wire of circular section was used.

Modern Design

Owing to mica being the only really suitable medium for this type of element, and due to a balance having to be struck in design between its low heat-conducting properties, insulation, and mechanical strength, some experimenting went on at first in order to find suitable thicknesses to fulfil these various considerations, and it was found that a reliable element resulted from winding the resistance upon a mica former twenty-five thousandths of an inch thick and interleaving this between mica plates ten thousandths in thickness.

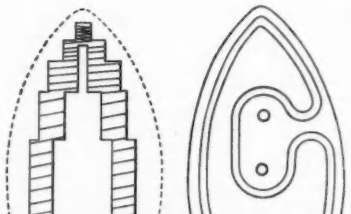
The great drawback to this construction is that a slab of iron is placed on top of the element, and as no proper provision is made for heat flow from this to the under or working part, the efficiency is not good, the heat from the top slab being lost by radiation, and that in an inconvenient manner, as it is just below the hand. The slab would be more useful if it were incorporated in the base.

There is no reason why this arrangement should be further perpetrated, although at the moment it is practically universal. In a far more efficient, reliable, and sounder, construction a spirally-wound resistance wire is threaded through beads of open-fire refractory material, this element lying directly in the base. The channel path is of suitable configuration to produce an even heat distribution over the whole, with some accentuation at the toe.

This construction has the advantages that only a light top plate is needed, the element being well down in the body, and that it is placed closely round the edges, raising these to a slightly higher temperature, a desirable point because these portions pass over the damp fabric first. A refractory slip may be placed below the top plate, ensuring that all heating is confined to the base where it is required, the whole of the main weight thus being of the working variety, or in other words none being for weight's sake alone. This brings about a further advantage, as it enables the base thickness to be augmented, thus permitting it to carry a greater reserve of heat. In some cases costs could even yet be further reduced, as in irons designed for the "laid on" or mica-type element, cover plates are often unnecessarily thick, the stock requiring expensive tools for manipulation.

So much ingenuity has been displayed in design in other directions, however, that the formation of the remaining parts has been reduced to a matter of orthodox construction and little difference is noticeable in the various products now in the field. Back stands upon which to rest the iron when it is not in use show the greatest diversity, some designers prefering those of the wire type whilst others utilise sheet pressings; the latter are more expensive but they will stand more ill-usage. Most of the designs, however, suffer from the fact that the centre of gravity of the complete iron is too far forward when in the tipped-up position, the result being that the iron is liable to fall forward with any slight jerk upon the lead.

Leads and connectors need to be of a very substantial nature from both a mechanical and electrical standpoint, as they are subject to much abuse. The point where the lead joins the iron is the vulnerable spot, and the contacts at this point need to be of good sectional area, as any slackness causes the usual heating and burning.



Dispositions of Flat-wire and Beaded Elements

General finish is provided for by electro-plating, either of the nickel or the chromium processes, and whilst this is straightforward enough in the case of the upper parts, it has not in the past been invariably so satisfactory for the base, which overheats when the current is left on.

The Iron in Use

In the actual use of irons close observation shows that domestic work is invariably spasmodic, and as the iron must be designed for a heat flow sufficient for continual work, a switching-off process must be resorted to, in order to prevent the iron becoming too hot whilst standing. On the whole this seems to be readily managed without trouble by the operator, but commendable features are a handy switch on the iron itself, or the incorporation of a thermostat in the base, both of which are now obtainable.

There is still ample scope for improvement from the electrical, or more strictly speaking, thermal point of view, as a considerable reduction in consumption is yet possible by a judicious study of the problem affecting element design and heat flow, and this has a direct bearing upon the questions of reliability, length of life, and efficiency, all of which are important points.

The London Electric Railway Bill

The Unopposed Bills Committee of the House of Commons, on September 30th, passed the London Electric, Metropolitan District and Central London Railway Companies' (Works) Bill for third reading. One of the principal clauses of the measure provides for the extension of the Bakerloo Railway by constructing a new line, one and three-quarter miles long, to Camberwell Green. Owing to the opposition of the House of Lords, the company has undertaken to build the new station on a site removed from the Green. Other clauses in the Bill relate to improvements at the Chancery Lane, Post Office, Knightsbridge, Hammersmith Broadway, Camden Town and Edgware stations. Part of the cost will be defrayed from capital already authorised, but the Bill also sanctions the raising of an additional £1,500,000.

Electricity in the Textile, Food, and Clothing Trades

REFERENCES have been made in the daily Press during the past fortnight to the restarting of works that have been closed down for some years. It is to be hoped that the opportunity has been taken in the interim to bring the method of driving such works up to date by providing for the increased use of electricity. That there is certainly room for improvement in this direction will be manifest from the table printed here, which has been abstracted from the two Final Reports of the Census of Production relating to the Textile Trades (51-178-1), and to the Food, Drink and Tobacco Trades and the Clothing Trades (51-178-2) (H.M. Stationery Office, 1930, 4s. 6d., and 1931, 5s. 6d. respectively.

Thus, we may take the case of ice-making machinery which required 37,800 h.p. Of that total. 17,100 h.p. was still driven by means other than electrical. The question that arises—and it is one that each undertaking must answer for itself—is how far this is due to lack of a whole-hearted endeavour to secure this desirable load with the indu ement of the kind of tariff that its high load factor would ii stify. The number of kWh sold per £ of distribution capital expenditure would be very considerably increased if the implications of the appended table received the consideration that they deserve.

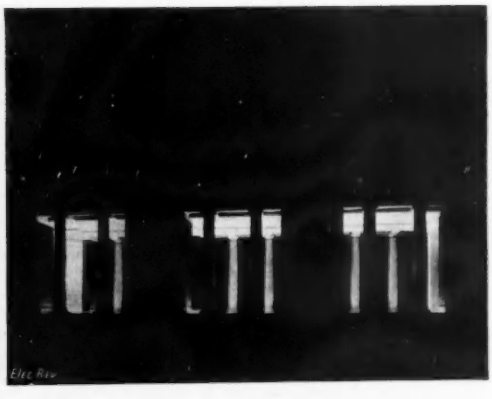
The Reports draw attention to the growth in the horse-power of motors driven by purchased electricity, which indicates a tendency to rely upon electricity for power purposes from public supply undertakings instead of installing plant in the factory itself for the generation of all electricity required.

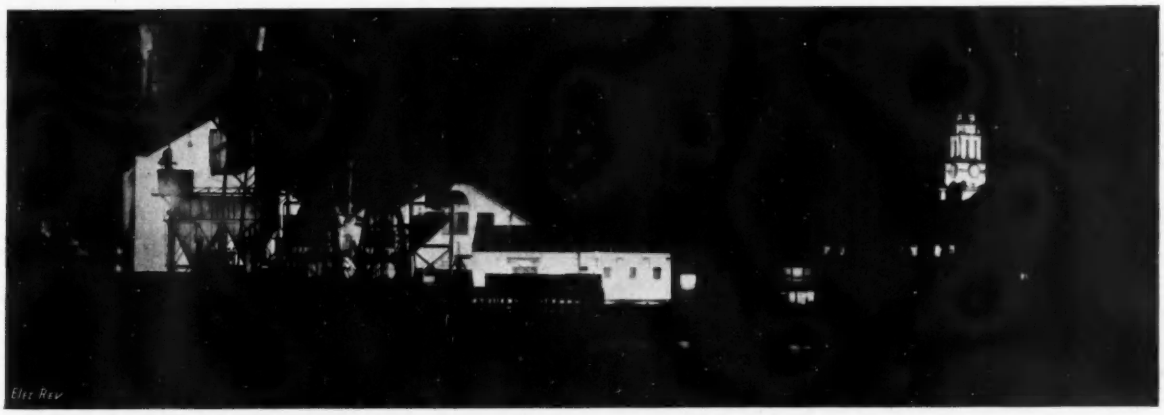
ANALYSIS OF POWER EQUIPMENT.

Trade.	Electric motors driven by purchased electricity.	Electric motors driven by electricity generated in works.	(Thousands of Horse-power.) Total electric motors.	Power other than electrical.	Total power equipment.	Power not supplied by electricity supply industry.
Cotton	181.2	92.4	273.6	1,278.2	1,551.8	1,370.6
Woollen and worsted	77.6	66.6	144.2	343.4	487.6	410.0
Silk and artificial silk	18.2	14.5	32.7	13.6	46.3	28.1
Linen and hemp	7.2	15.6	22.8	77.0	99.8	92.6
Jute	7.3	7.7	15.0	40.3	55.3	48.0
Hosiery	14.2	2.7	16.9	10.5	27.4	13.2
Textile finishing	65.2	82.2	147.4	139.0	286.4	221.2
Lace	3.9	2.2	6.1	6.4	12.5	8.6
Rope, twine, and net	10.7	3.8	14.5	16.6	31.1	20.4
Elastic webbing	1.8	0.2	2.0	0.7	2.7	0.9
Coconut fibre, ramie fibre, horsehair, and feather	1.7	0.7	2.4	1.8	4.2	2.5
Flock and rag	6.8	0.6	7.4	7.6	15.0	8.2
Packing	3.1	0.0	3.1	0.2	3.3	0.2
Grain milling	57.4	13.1	70.5	128.2	198.7	141.3
Bread and biscuit	66.1	3.1	69.2	14.7	83.9	17.8
Cocoa and sugar confectionery	44.0	11.0	55.0	6.9	61.9	17.9
Bacon curing and sausage making	8.1	1.9	10.0	3.3	13.3	5.2
Preserved meat, fish, fruit and vegetables pickles, and sauces	13.8	3.7	17.5	3.4	20.9	7.1
Butter, cheese, condensed milk, and margarine	5.4	13.3	18.7	9.7	28.4	23.0
Fish curing	0.9	0.0	0.9	0.5	1.4	0.5
Cattle, dog, and poultry foods	8.4	0.6	9.0	6.1	15.1	6.7
Ice	19.1	1.6	20.7	17.1	37.8	18.7
Sugar and glucose	4.0	30.4	34.4	10.0	44.4	40.4
Brewing and malting	57.3	7.7	65.0	34.5	99.5	42.2
Spirit rectifying, compounding, and methylating	0.4	0.0	0.4	0.3	0.7	0.3
Wholesale bottling	7.5	0.4	7.9	2.4	10.3	2.8
Aerated waters, cider, vinegar, British wine, etc.	7.8	0.2	8.0	6.8	14.8	7.0
Spirit distilling	4.8	4.5	9.3	6.7	16.0	11.2
Tobacco	9.6	2.7	12.3	3.0	15.3	5.7
Clothing	28.7	2.2	30.9	6.5	37.4	8.7
Boot and shoe	32.7	3.4	36.1	23.0	59.1	26.4
Hat, bonnet, and cap making	9.0	0.7	9.7	2.7	12.4	3.4
Glove	0.5	0.2	0.7	1.5	2.2	1.7
Umbrella and walking stick	1.3	0.6	1.9	0.4	2.3	1.0
Fur	1.6	0.0	1.6	0.2	1.8	0.2
Artificial flower and ornamental feather	0.2	0.0	0.2	0.1	0.3	0.1
Laundry, cleaning, and dyeing	18.1	3.8	21.9	38.0	59.9	41.8
Total of Textile, Food, Drink and Tobacco, and Clothing Trades	805.6	394.3	1,199.9	2,261.3	3,461.2	2,655.6
Add Iron and Steel, Engineering and Non-ferrous Metal Industries*	2,177.5	1,017.9	3,195.4	1,779.0	4,974.4	2,796.9
Combined Total	2,983.1	1,412.2	4,395.3	4,040.3	8,435.6	5,452.5

* "Electrical Review," September 11th, 1931 (page 386)

The cotton trade was the least electrified, under 20 per cent. of the h.p. installed being electrically driven.





Three Examples of Effective Floodlighting: The Wellcome Chemical Works, Dartford (top left); the Mercantile Memorial, Stepney (top right); and Limehouse Generating Station, and St. Anne's Church, Stepney (bottom).

The Norwich Rural Scheme

Low differential secondary charges encourage water- and space-heating

IN our issue of March 27th last, we published an article on the scheme of the Electricity Commissioners for the electrification of the rural area around Norwich. We are indebted to Mr. F. M. Long, City Electrical Engineer of Norwich, for the following notes regarding constructional work and consumer developments before and subsequent to the issue of the Commissioners' scheme.

Prior to 1926 the area of supply of the Norwich Corporation comprised the City of Norwich and fifteen parishes immediately adjacent, covering in all about forty square miles. These parishes are mainly rural and very little supply had been given except in portions of four of them that form suburbs of Norwich.

The population of Norwich is 126,207 (1931) and that of the fifteen parishes (known locally as the "fringe area"), was 8,006 in 1921 and is now probably 9,000 to 10,000. (The 1931 census figures for parishes are not yet published.)

In 1926 a Special Order was obtained adding 370 square miles, and in 1930 a further Order, bringing the total, including Norwich and the fringe, to 700 square miles. The area added by these two Orders includes one urban district (North Walsham), and 258 parishes with a total population of 92,127 (1921). The urban district of East Dereham, with a population of 5,641, is within this area, but the district council is a statutory authority and carries out the distribution, taking its supply in bulk from Norwich.

The other principal towns and their populations are: North Walsham (4,137)) Wymondham (4,814), Aylsham (2,466), and Attleborough (2,453).

Apart from these, the parishes vary from 17 to 1,413 inhabitants and the average density of the rural area is 139 per square mile.

An Area of Arable Farms

Arable farming constitutes the predominant occupation and there are no industries outside the towns mentioned above, with the exception of the Cantley Sugar Factory, which takes a supply mainly for the off-season period. In the towns, apart from Messrs. Gaymer's factory at Attleborough, there are no large consumers and in the aggregate the consumption for power is only 22 per cent. of the whole.

Poultry farming is a growing industry and there is a prospect of a considerable demand for current. Already one poultry farm is fully equipped with incubators, brooders, &c., electrically heated, and others are considering the use of electricity.

In certain parts of the area there are marshes, at present drained by windmills, or steam and oil engines, for which electricity is eminently suitable. The conversion of some of these is under consideration.

The work in the area was commenced in 1926, the first line being an underground cable to Wymondham, a distance of nine miles. This was followed the next year by an overhead line to North Walsham (14 miles). Other lines followed quickly extending the supply to Dereham, Attleborough, Loddon, Aylsham and a number of smaller towns and villages.

The system of supply is 3-phase, 400/230 volts, 50 cycles for distribution and 11,000 volts, 3-phase for transmission. The generating pressure is 6,600 volts.

The portion selected by the Electricity Commissioners as a "demonstration area" is in the north-west, with Reepham as a centre. The construction of 11,000-volt lines and distributing mains in this area was commenced about six months ago, and substantial progress has been made towards completing the work within two years.

A Supply to Every Farm and House

The main purpose of this special scheme is to render a supply available for every farm and house (except isolated cottages), where such is desired, without any charge for mains or any guaranteed return, with a view to ascertaining what the demand and consumption will be under these conditions.

The general scheme of transmission mains comprises a main ring 65 miles in length through Wymondham, East Dereham, Aylsham and North Walsham, with a smaller ring in the south serving Cantley and Loddon. Other ring mains are built up on these so that, except for spur lines, it will be possible to serve all the principal places from two directions. This is important, as continuity of supply is almost as essential in the country as in the towns if electricity is to be relied upon for cooking and other domestic uses.

It was realised at the outset that if extensions into the country were to be a success, a supply must be brought within the reach of as many consumers as possible, and at such prices as would induce its use for all domestic purposes, such as cooking and heating, hot water, &c., as well as for lighting. With this in view, facilities are given for the hire-purchase of installations over three, five, or ten years. The Corporation does not carry out such work in the country, but where hire-purchase terms are desired it pays the contractor on completion and recovers the cost from the consumer by quarterly payments arranged to include interest over the period agreed. In the case of cottages and Council houses that do not involve extensions of mains, a free-wiring scheme is adopted with slot meters. This work is also done by the contractors on a schedule of prices. These facilities have had the result that nearly every house is connected up as soon as the supply is available.

The tariff for domestic supplies is a fixed charge of 20 per cent. on the rateable value and 1d. per kWh.

An Active Publicity Organisation

Canvassing for lighting is effectively done by contractors seeking installation work; but for the further development of the use of electricity, exhibitions have been held in the larger centres which have been well attended. The Corporation has a demonstration van which, as far as possible, is sent to each village shortly after the supply is available to give practical demonstrations of cooking; at the same time the housewives are visited in their homes.

The number of electric cookers at April 1st, 1930, in the rural area was 89, at which date the secondary charge was reduced from 1½d. per kWh; after eighteen months there are now 505 cookers, and they are going out at the rate of thirty a month. Incidentally, it may be mentioned that there are in Norwich over 4,000 cookers.

For the handling of the cookers a special 8 cwt. van, capable of carrying two cookers, is employed, this being driven by a man who carries out the fixing with the aid of a junior. The presence of the van in a village has an advertising effect; the man who drives it has leaflets and a few domestic appliances such as flat-irons, kettles, etc., for which he is often able to book an order.

Of the cookers installed, approximately ninety are of the small type used in the cottages and smaller houses. A rental of 4s. per quarter is charged, and the general experience is that at 1d. per kWh electricity is cheaper than oil.

Special Rates for Water- and Space-Heating

Electric water heaters and wash boilers are also coming into use, the number now being forty-seven. To encourage the use of current during the night a special rate of ½d. is charged for consumption between 10 p.m. and 8 a.m. for heating storage tanks. This rate would also apply to bakers' ovens used through the night, though none as yet has been installed.

The use of electricity for lighting churches and chapels is becoming very popular and has been adopted in forty-seven cases. In five of these electricity is also used for heating, at a special rate of ½d. per kWh, with very satisfactory results.

The area is divided into three districts, each under a district engineer who is responsible for all the constructional work and the maintenance and development of the district generally.

The distribution work is partly overhead and partly underground. Where the houses are close together and expensive reinstatement of surfaces is not involved, underground cables can be laid almost as cheaply as overhead; but if the houses are at considerable distances apart, overhead work is necessary.

Almost the whole of the overhead 11,000-V lines have been erected by Messrs. Johnson & Phillips, Ltd., as well as some of the distribution work; but the greater part of the latter has been done by the Corporation staff.

The work accomplished between 1926 and March 31st, 1931, may be summarised thus:—163 miles of 11,000-V lines have been erected, constituting the main transmission system for supplying the area. Distributing mains have been laid, and a supply given in fifty-five towns and villages, the number of connections being 3,178. Since April 1st, 1931, a further fourteen villages have been connected. The total expenditure to March 31st last was £195,000. The revenue for 1929-30 was £12,097 and for 1930-31, £19,865, the kWh sold for the two years being 1,190,271 and 1,947,855, respectively, including bulk supplies to East Dereham and Acle.

It is not to be expected that, while heavy capital expenditure is being incurred, the revenue will be sufficient to cover all the items of expenditure involved in giving a supply, but it is satisfactory to note that all the additional cost or "out-of-pocket" expense is now covered, so that the undertaking as a whole is suffering no loss from the rural supply.

Ultra-short-wave Telephony in Hawaii

For some years the Mutual Telephone Co., Honolulu, has studied the possibilities of inter-connecting the various islands telephonically. Rough seas and depth of water do not favour cable laying, while radio-telephony with medium and short waves, 1,500 and 5,000 kc., is not satisfactory owing to selective fading and strong atmospherics, the cost of overcoming which defects the company could not afford. Tests having been successful, it has now been decided by arrangement with the R.C.A. organisation to provide an ultra-short-wave service. With Oahu as the centre there will be a two-way service between that island and Maui, Kauai, and Hawaii, also between Hawaii and Maui, to begin with; and later on additional services will be provided between Oahu and Maui and between Oahu and Hawaii, also between Oahu and the islands of Lanai and Molokai. The frequencies will range from 35,200 to 54,000 kc. These circuits, together with the facilities now being provided by R.C.A. in Hawaii to connect the Mutual Telephone Co. with the telephone system in San Francisco, will soon link the important islands of Hawaii with many countries through the world-wide telephone system of the American Telephone & Telegraph Co.

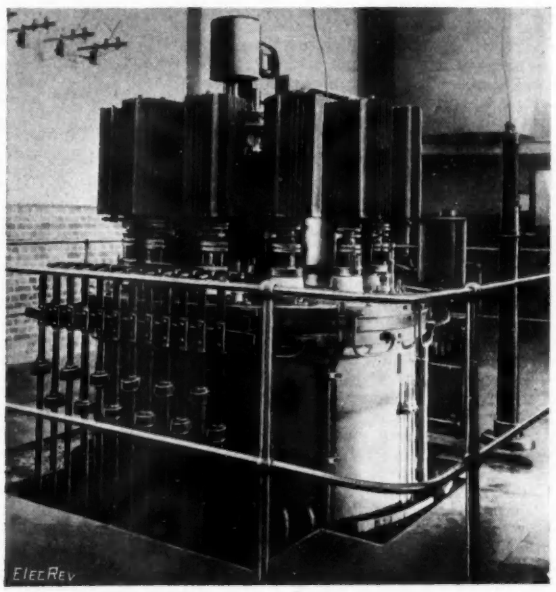
Rectifiers for Railways

The first mercury-arc rectifier to be put into heavy railway service in England is the 1,500-kW unit installed for the London Tube Railway

THE latest sub-station of the London Electric Railway Co.—that at Hendon on the Edgware line—contains a 1,500-kW 615-V rotary convertor, and a similar rectifier, working in parallel and automatically controlled; both have an overload rating of 5 per cent. for one hour, or three times full load momentarily. The sub-station is fed at 10,500 volts, from either Neasden or Lots Road power stations.

Difficulties in rectifier operation are greatest during the first few months of service, and there is now sufficient experience of the performance of the Hendon set to claim that the departure from previous practice of conversion has been justified.

The rectifier, as may be seen from the illustrations, is a 12-anode machine with the mercury-vapour pump and rough-



vacuum pump carried on the rectifier itself, so that all vacuum connections can be made independently of the setting up of the unit on site.

The mercury pump is heated by transformer action, thus eliminating the risk of burn-out that exists with resistance-heated pumps. The vacuum chamber is of steel plate fabricated by the atomic hydrogen method of welding. All vacuum seals are made with mercury. The main supply of cooling water (about 9 g.p.h. per 100 amp-hours) is controlled by a thermostatic water-valve. The top half of the rectifier, which carries the anodes, is detachable, and the anodes and interior can be easily inspected. The anodes are provided with tips of special graphite, which has been found to resist " bake-out," overload and arc back.

Warming Before Loading

Before the rectifier is put on load its temperature can be raised by an internal heater, as the load a rectifier can carry is very much lower when the general tank temperature is, say, 15 to 20 deg. C. than when it is 40 to 50 deg. C.

Current for the a.c. ignition and excitation is taken from an air-cooled transformer. The six-phase excitation enables small loads (even that of a voltmeter) to be carried with certainty without any sacrifice of arc-back protection. The complete process of ignition takes place automatically in a few seconds, and there are no rheostatic losses in the excitation circuit. The rectifier has been sunk through a hole in the sub-station floor, thus enabling the upper parts, including the vacuum seals, to be easily inspected, while the cathode and main connections are readily accessible in the basement.

The main transformers are single-phase units, and are air-blast cooled to comply with the requirements of the railway company. They carry a low-voltage tertiary winding, which is normally used for supplying the transformer blower motor, the internal heater, and the " bake-out " process. The secondary windings are protected from the possibility of the production of surges from the arc in the rectifier by means of a set of horn-gap surge arresters with limiting resistors.

If the rectifier has been opened to atmosphere, it is necessary to drive off the occluded gases from the interior before the best vacuum conditions can be obtained; a " bake-out " equipment has been provided by means of which the rectifier can be loaded at low voltage and progressively increasing current, in order to drive off these gases.

The d.c. voltage wave contains a ripple, and, in order to avoid interference with telephones, a smoothing circuit is provided, by means of which the harmonics of the d.c. voltage are reduced to a value that experience with rotary converters has shown to be safe under all conditions. The smoothing circuit consists of a reactance coil, in series with the rectifier on the d.c. side, and five resonant shunts across the d.c. load, each consisting of a coil and condenser tuned respectively to frequencies of 200, 400, 600, 800, and 1,000 cycles. The d.c. reactor is of the air-core type, and its coil consists of heavy copper strap wound on edge.

Control Equipment

A high-speed breaker on the positive side is connected for reverse tripping. Protection against d.c. short-circuits is obtained by high-speed breakers on the feeders, arranged for forward tripping, so that only the faulty feeder is isolated. The negative return rail is insulated from earth to reduce the cost of track signalling apparatus, and an additional high-speed breaker is provided on each d.c. feeder on the negative side; there is also an electrically operated circuit breaker between each machine and the negative bus-bar.

The reverse-current high-speed breaker is interlocked with the rectifier oil switch, to ensure instantaneous tripping of the latter. A.c. overload relays with a small time delay, having an inverse time characteristic, are also provided.

The rectifier is started by closing either the remote-control switch at Golders Green or the local-control switch at Hendon. If all the protective relays indicate that the rectifier is in correct condition to operate, the main oil switch closes, energising the main transformers and starting the transformer blower motor. If the correct operating temperature has not been reached, a thermostat prevents the operation from proceeding further, and switches on the internal heater. As soon as the right temperature is reached the heater contactor opens and the ignition and excitation transformers are energised, whereupon ignition is automatic.

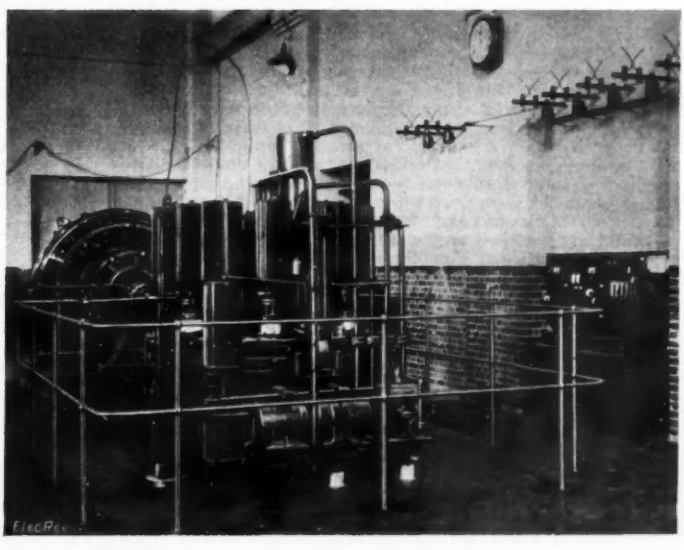
Automatic Restarting

The rectifier is shut down automatically in the event of any of the following disturbances, and will restart automatically on restoration of correct conditions: failure of (or excessively reduced) supply voltage, failure of vacuum or main cooling water, excessive temperatures of mercury-vapour vacuum pump, and a.c. overloading.

In the event of an arc-back the set will automatically restart after a few seconds; if the arc-back is repeated, the set will restart itself up to a definite number of times, after which it will be locked out of service.

The rectifier is locked out of service until restarted by hand in the event of the tripping of the a.c. earth-leakage relay, the stalling of the rotary vacuum-pump motor, overheating of the main transformers, failure to complete starting operations within a definite time, overload on the heater circuit, and breakdown to earth of auxiliary currents at tank potential.

The London Electric Railway Co. has placed a further order with the British Thomson-Houston Co., Ltd. (which supplied the rectifier, rotary convertor, and the whole of the sub-station equipment) for seventeen more 1,500-kW and five 2,000-kW rectifiers and equipment—the largest order for rectifiers yet placed in this country.



The Societies and Their Doings

Electric power for marine and railway purposes

Electric Railway Traction

THE principles on which electric power is applied to railway traction were outlined by Mr. W. A. Agnew, of the London Underground Electric Railways, in his presidential address to the Institution of Locomotive Engineers.

In this country the present electrified mileage (excluding the Metropolitan and Underground Railways) is about 500 only, eighteen miles being used for freight traffic. Opinions differ about the merits of a.c. and d.c. traction; perhaps neither system is perfect for every kind of railway service, but Ministry of Transport Committees have decided that d.c. shall be used, with, for third-rail systems, a maximum pressure of 750 volts at the sub-stations, and for overhead contact systems a maximum of 1,500 volts, although in special circumstances 3,000 volts may be approved. The system becomes economically sound only when the traffic is of such density as to require the use of a frequent service of trains extending over many hours of the day. On passenger service of this character the multiple-unit system of train formation is distinctly preferable to haulage by electric locomotives; while most valuable for meeting suburban services, this system is also deserving of consideration for comparatively long-distance work.

There must always remain the advantage of centralising the main source of energy instead of constructing innumerable separate power units on wheels, each operating under varying load conditions not conducive to maximum economy. The high availability and low fuel cost of oil tractors entitle them to consideration on lines with infrequent services, on branch lines, and certain sidings where the daily duty would fail to properly utilise the track equipment of an electric system. But, except for such auxiliary railway purposes, the oil tractor system must rank as second best under British conditions. Admittedly it is likely to be cheaper than electricity in first cost, but the quality of service will be lower. Also there is the fact that with the electric track equipment in position considerable increases in traffic could be met with less additional expenditure for electric rolling stock than for the necessary additional oil tractors. What must be borne in mind is not merely the rate of return that may be expected from the expenditure, but the amount of new life that can be injected into the whole railway system.

We must look at the problem as a national one, and cannot disregard the advantage to the national power distribution system of the railway load and the favourable reaction on the cost of electricity which would result. However, the mere change would not automatically restore the fortunes of our railways. To fully utilise the new system it is necessary to make other extensive changes. For frequent services automatic signalling is a necessary adjunct, and the possibility of automatically-controlled trains must not be dismissed, though it may only prove practicable in very special circumstances, but some form of continuous control would increase the factor of safety and keep trainmen informed of all operating requirements. Mixed traffic is embarrassing by reason of the different speeds of passenger and freight trains, and to work with the least number of vehicles means high average speeds. If we cannot better the speed of freight on rails, we will see more of it going on to roads. Automatic brakes on all trains is a necessary aid, although, of course, it does not completely solve the problem of moving goods more rapidly from door to door. A constant supply of cheap electricity at every point of the line would render most important aid in manipulation and quick loading and unloading apparatus.

Before any extensive electrification takes place, the whole use and service of the railway system require study to determine to what extent the existing lines could be fused into a more coherent whole, preferably under one governing control.

What, after all, does a large area of our small country consist of but a series of suburban areas? Electric lines between important centres or through populous areas would surely respond to frequent fast and cheap services.

Modern Ship Propulsion

IN his presidential address to the Institute of Marine Engineers, Mr. F. E. Rebbeck, chairman and managing director of Harland & Wolff, Ltd., pointed out that perhaps sooner than some of us think new tonnage will be needed when trade begins to move again, not because ships are not available in this country, but because much more economical vessels than those which have been lying up for so long as to have become out of date will be needed to compete with modern foreign ships.

Development has been so rapid that the subject of propulsion has become intensely controversial, and shipowners will find it difficult to satisfy themselves which method is the best commercially.

For slow tramp cargo vessels owners will call for simple triple-expansion steam engines with two or more cylindrical boilers and the minimum of auxiliary plant.

For large fast passenger liners, of which there are not many, the consensus of opinion at the moment is in favour of high-pressure high-temperature steam installations, consisting of water-tube boilers and geared turbines, with every conceivable refinement for increased economy. To realise the maximum in this direction, the electric generating units should be driven by oil engines. There are a few who in the interests of still further economy would propose Diesel-electric propulsion for this type of vessel, and some who would adopt a turbo-electric system, but neither of these would represent the opinion of the majority of authorities on the subject.

The intermediate class of cargo-passenger vessels, which constitutes such a large proportion of the world's tonnage, calls for expert judgment; what may be suitable for one particular service may be out of place for another, and the owner ends by buying the cheapest in first cost.

When any particular system is substituted for an existing one we must be careful not to assume that it necessarily means the condemnation of what has been taken out. In such cases, frequently, the installation removed is invariably a pioneer, and by no means representative of what can be done in later vessels.

While it is true that considerable improvements in power, or economy, can be realised in existing installations in various ways, such as by the introduction of exhaust turbines, applied either through the medium of gearing or by electrical transmission, or by the adoption of one or other of the patent valve systems which can be incorporated in the high-pressure cylinders of reciprocating engines, these must nevertheless be palliatives—very useful, but not likely to be regularly adopted.

Electrical Theory and Practice. By G. Windred

THERE is an unfortunate deviation between the views of the theorist and the practitioner concerning the usefulness of theoretical investigations, but electrical history shows that these two classes are in reality closely related. The progress of electrical practice is founded on pure science, and contains many examples of the manner in which the latter has produced discoveries of great practical importance.

By means of an historical retrospect, some of the more outstanding of these developments are traced in the paper the author presented before the second International Congress of the History of Science and Technology in London, in which he points out that just as the work of Oersted was advanced by the mathematicians Biot, Savart, and Ampère, so also was the work of Faraday advanced by the English mathematicians of the nineteenth century.

An outstanding example of the relationship between pure and applied electrical theory is afforded by the modern theory of electrons founded by Sir J. J. Thomson at Cambridge towards the end of last century. This highly abstract theory is one of the last from which one would have anticipated the emergence of practical utility.

Just as the practitioner builds upon the results of the research worker, so also do the research worker and theorist depend greatly upon the pure mathematician for the weapons of analysis with which to achieve their results. Electrical theory provides many examples of this dependence, and makes use of a very large portion of the domain of pure mathematics.

In alternating-current circuit theory and in certain problems of electrostatics involving a two dimensional form of Laplace's equation, much assistance is derived in practice from the use of "complex quantities," relying for their physical interpretation upon the unassignable square root of minus one. The origin of these purely mathematical conceptions goes back far, and their development has, strangely enough, often been in advance of strict mathematical logic. Nevertheless, they have proved of great practical value, and have rendered possible the solution of otherwise insoluble problems of great importance in electrical circuit theory, the theory of electrostatics, and analogous problems in hydrodynamics.

Thus we have an outstanding example of the practical application of a branch of pure mathematics which was developed during several centuries without a thought of ever being applied for utilitarian purposes.

To use a simile of Sir J. J. Thomson: "The mathematical method is the better for developing ideas, the physical for originating them; the mathematical, so to speak, is the better incubator, the physical the more prolific hen: both are essential."

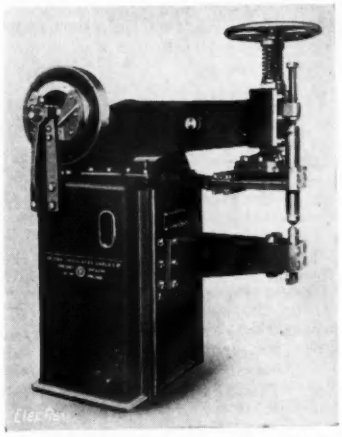
The present tendency towards intense specialisation makes the progress of science more than ever dependent upon the co-ordination of pure and applied theory, which can be achieved only through close collaboration between the pure theorist and the practitioner, a matter which should be given constant attention.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Automatic Spot Welder

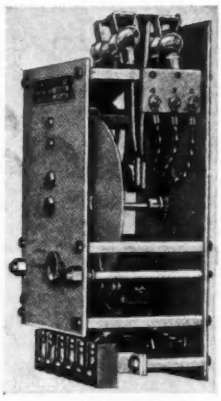
Spot welding by the foot operation method has not generally been sufficiently reliable for use on thick material, owing to the fact that it is impossible in practice to judge when the metal has reached the correct temperature for welding. In the "Prescot" automatic spot welder No. 90 recently introduced by BRITISH INSULATED CABLES, LTD., Prescot, Lancs., however, a method of operation is adopted by means of which the weld is automatically upset when the correct temperature is reached. This makes all welds consistent and renders it possible to use spot welding when such a result is imperative. The machine is power driven and operates as follows. The operator closes the switch which throws in the clutch. The upper electrode is brought down on to the job and the welding current is switched on. The clutch circuit is automatically broken at this point. The metal commences to heat and when it has reached the correct temperature the clutch is again thrown in, the welding current switched off, the upsetting pressure applied and the electrode raised ready for the next weld. The machine will weld up to two ½-in. plates.



"Prescot" Automatic Spot Welder

A Sign Flasher

BATWIN ELECTRICAL APPLIANCES, LTD., 138, Southwark Street, S.E.1, are introducing in this country a new type of sign flasher, the "Kontroler." It comprises oscillating mercury tubes which make and break the necessary circuits through the medium of an induction disk and shaded poles. Speed can be instantly varied while the flasher is operating by the mere movement of a couple of thumbscrews. The weight of the whole apparatus is only 4 to 5 lb., and the space occupied is practically nothing. The loading is about 10 watts. The machine is available for spelling, border flashing, "on and off" flashing, or any combination of these.



Batwin Sign Flasher

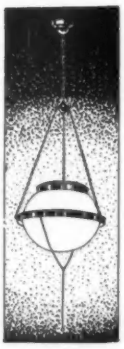
A Washer and Wringer

The increasing popularity in this country of electric washing and wringing machines favours the introduction of the new electrical washer and wringer, by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. The quiet simplicity of its operation and low current consumption (¼ kWh per hour) commend it as a practical machine to the discerning housewife. The container is finished in double-coat porcelain enamel, which keeps the water hot longer and is easy to keep clean after use. The specially designed vane agitator washes very quickly, and cleanses anything alike, from silks to heavy blankets; having no sharp edges it can do them no injury. The vitreous-enamelled interior is proof against chemicals or dirt solvents, and its appearance will indefinitely retain its freshness. The swinging reversible wringer, fitted with semi-soft rollers, 12 in.×1¾ in., locks in six different positions, and can be instantly adjusted for articles of any thickness. The machine is driven by a ¼-h.p. motor, and its net weight is 170 lb. Both rollers can be easily lifted out for cleaning and replaced in a few seconds.

G.E.C. Washer and Wringer

"Sunshine" Lamp

The "Vitreosil Sunshine" lamp, introduced by the THERMAL SYNDICATE, LTD., Wallsend-on-Tyne, has been designed to provide a close approximation to sunshine, including, more particularly, the proportion of ultra-violet radiation known to be beneficial to health. The unit is suitable for single-phase a.c. supply of 40 to 60 periods, and comprises an evacuated type a.c. quartz mercury-vapour burner of "Vitreosil." Its total consumption is 1,125 watts, and it produces 825 m.h.s.c.p. visible illumination over the lower hemisphere. The light given out over the upper hemisphere is only slightly less, and contributes very largely to the effectiveness of the general illumination. Two complementary light sources are mounted inside a handsome spherical three-piece diffusing and filtering globe of translucent "Vitreosil," 16 in. in diameter, which is supported from the ceiling plate provided by a substantial brass ring, centre-chain, ball fitting, and three suspension chains, all handsomely finished in oxidised silver. The globe is so arranged that it may easily be removed for cleaning or for the insertion, cleaning, or renewal of the burner or metal-filament lamps. The overall length, excluding the starting chain, from the ceiling plate to the bottom of the bowl, is 3 ft., but it can be reduced to 2 ft. by taking out the centre chain. In addition to the burner, holders and connections are fitted for four 100-watt Edison screw socket metal-filament gasfilled lamps, which are arranged to be operated from a separate switch, and which provide the yellow rays lacking in the light from the mercury burner. Inside the globe there is a substantial mechanism for tilting the mercury burner when starting it. This mechanism is conveniently operated by means of the chain provided on the outside of the globe. The overall dimensions are 1 ft. 7 in.×1 ft. 3 in.×6⅜ in., and the weight is 76¼ lb.



"Vitreosil Sunshine" Lamp

A Spotlight Projector

The "Credalux" spotlight projector illustrated is a recent introduction of the CREDENDA CONDUITS CO., LTD., Oldbury, near Birmingham. To meet with the requirements of this special form of lighting for 200-W lamps, the company has developed a new design of refractor, formed by a special process which gives a hammered finish without affecting the highly polished optical surface. The slight facets formed are just sufficient to break up the light rays and so destroy all tendency to cast striations or images of the lamp filament. Other special features of this fitting include a self-supporting base with universal joints, which enables the reflector to be trained in any direction, and also permits of it being stood upon a shelf without the need of screws. In addition to its uses as a shop-window fitting, the "Credalux" spotlight has been found to be eminently suitable for a number of classes of special lighting applications, such as the concealed or flood method of lighting churches and other interiors. A number of satisfactory installations have been made during the past year; their success is doubtless largely due to the fact that the wide range of focusing adjustment can be utilised without the formation of the usual dark centre to the beam of light.

"Credalux" Spotlight Projector

Motor-vehicle Brake Tester.

Among the new motor garage equipment being introduced by JOSEPH BRADBURY & SONS, LTD., Braintree, is the G.E. electric brake tester. The machine is of the drive-on roller type and is actuated by the driver of the vehicle on test; by pushing down an electric switch the resistance of each wheel is clearly shown on a dial facing the driver, and all brake troubles, it is claimed, at once become apparent. One of the advantages of the machine is that it is equally sensitive for a small car as for a large vehicle, owing to the provision of an easily-adjusted variable gear ratio.

Book Reviews

Electric Motor Management. By A. H. AVERY, A.M.I.E.E. Pp. 146; figs. 103. London: Percival Marshall & Co., Ltd. Price 3s. 6d.

This book has been written primarily with a view to affording assistance to those engaged in connection with the installation and maintenance of the power supply in mills and workshops who may be faced with a change-over from the older mechanical to the newer electrical methods.

To explain the fundamental properties of the electrical circuit to such men is not easy and the author rightly makes use, whenever possible, of analogies with mechanical arrangements with which the reader is likely to be familiar. In general, his method would appear to promise good results.

A few points need clearing up. Thus it is particularly unfortunate that fig. 1 should apparently have been inserted upside down with the result that water is shown as flowing from a low to a high level. Again, in his effort to maintain simplicity of language, the author states on page 9 that electromotive force is the same thing as potential difference, whereas, in ordinary electrical usage somewhat different meanings are attached to these two terms.

Turning to the more practical portion of the book, the author may be commended for the great stress laid on the importance of using a type of motor giving the characteristics most suitable for the machine to be driven, and upon the great variety of characteristics that are available in the many types of commercial motors. In this connection the author hardly does justice to the starting torque of the d.c. shunt motor and on page 70 he classes it in this respect with the squirrel-cage type single-phase induction motor. His point is, apparently, the slow building up of the field current, but the importance of this phenomenon, which is of a very transient nature in motors of ordinary size, appears to be unduly stressed.

Switchgear, for both a.c. and d.c. motors, is comprehensively treated and illustrated by many excellent diagrams of connections. In this section readers may get a wrong impression from a remark concerning star-delta starters on page 99, where it is stated that the starting torque is reduced as the square of the voltage impressed on the phase winding, while the starting current is reduced in proportion to the reduction in the voltage per phase. The statement concerning current is correct as regards the current in the phase but not if applied to the line current.

Elementary Technical Electricity. By L. T. AGGER. Pp. xii+268; figs. 149. London: Longmans, Green & Co. Price 3s. 6d. net.

This is a cheap little book intended to meet the requirements of electrical apprentices attending first year courses at evening classes, and it can hardly fail to make a very wide appeal among the many boys in the engineering trades who are studying electricity.

While there would seem to be many obvious disadvantages in teaching electromagnets and galvanometers before describing the common cells from which current is derived, the author's method has two outstanding merits: it enables him to reach the study of the most important electrical apparatus, the dynamo and motor, at a very early stage, and it effectively links up the study of magnetism with its very practical outcome in electro-magnetic phenomena. Although his order of treatment is unconventional, it certainly serves the purpose of maintaining the interest of the student, and it has the other advantages to which we have referred.

In addition to a large number of worked examples in the text, there is a good collection of nearly 200 exercises selected from various recent examination papers, and the book is well indexed and produced. It will be most useful in technical schools and institutes as a first-year text-book.

Mitteilungen aus den Forschungsanstalten des G. H. H. Konzern. (Reports from the research laboratories of the Gute-Hoffnungs-Hutte concern). Nr. 5, 22 pages, with 15 illustrations and 5 tables. Berlin: VDI-Verlag. Price 3 marks (3s.).

Whereas the previous "Mitteilungen" mainly dealt with engineering materials, the greater part of this number is devoted to questions connected with electricity supply. With the aid of numerous photographic reproductions and diagrams, Herr M. Gercke, Augsburg, reports on large Diesel engines in the service of electricity works. By virtue of operating results, proof is presented that the Diesel engine is excellently suited for peak-load services and to serve as a stand-by.

The author considers that the enormous capital invested in large power stations and their distributing systems can best be utilised by making such plant work at maximum load during the longest possible period, assigning to it only the generation of the base load. The peak loads, he considers, should be generated near the centres of consumption by special peak-load stations and, on account of their low installation cost, he considers that Diesel engines are specially suited for this purpose.

In connection with the problem of peak loads, the employment of Diesel-driven generators for the operation of electric railways is also discussed at some length. The co-operation of electricity works with the coking by-products industry is also thoroughly examined. The investigation shows that, on the basis of present-day fuel prices, vertical airless-injection, gas-oil-driven, double-acting two-stroke engines are the most appropriate type for peak-load Diesel engines in the narrower sense, whilst in the broader sense (increased peak-load service, week-end, and seasonal loads with prolonged periods of use) vertical double-acting two-stroke engines with air injection of coal-tar oil are held to be more suitable. Comprehensive tables of figures show the economic operating results of the various methods of power generation.

The Quest for Power. By HUGH AND MARGARET VOWLES. Pp. xv+354; illustrated. London: Chapman & Hall, Ltd. Price 15s. net.

The subject of power has not been neglected in scientific literature during the last few years, having received considerable prominence consequent on the results of the deliberations of the World Power Conferences held in 1924 and 1930.

Volumes dealing with this subject are, in general, either scientific treatises or popular accounts, but in this volume the authors have attempted to combine the two, and have produced a book mainly for the general reader.

To record adequately within the space of one volume the early efforts of man at tool making, his primitive art in relation to engineering progress, the beginnings of culture and specialisation and early structural achievement, through the course of time down to the development of electrical generation and transmission is inevitably a difficult task. It requires considerable intuition, recognition of purpose and a genius for placing particular developments in true perspective. The volume is written in a manner which is remarkably free from technicalities, and can be recommended as a general account of human activity in acquiring power from early history up to the present day.

High-frequency Alternating Currents. By KNOX MCILWAIN and J. G. BRAINERD. Pp. xiii+510; figs. 226. London: Chapman & Hall, Ltd. Price 30s. net.

This is the first completely satisfactory text-book on high-frequency alternating currents which has come to our notice. Whilst in no respect original in choice of material or exhaustive, it covers a wide and well-chosen field, and has the principles of the various branches of the subject correlated at all points with modern practice.

The book has been written for the use of senior and graduate students in electrical engineering classes in the United States. It assumes a sound elementary knowledge of the calculus and of the simpler properties of alternating currents, as well as a certain familiarity with complex numbers, and should thus serve as a text for the use of classes of similar status in this country, and for anyone interested in electrical work who has the necessary mathematical equipment. The one fault we have to find is in the price; this must inevitably make the book inaccessible to many students who could profit by it.

The Revised Heat Drop Tables (1931). Calculated by HERBERT MOSS, D.Sc., from data by Prof. CALLENDAR. London: Edward Arnold & Co. Price 12s. 6d. net.

This is the third book of heat drop tables based on Callendar's steam equations calculated by Dr. Moss. The first set of tables, published in 1917, covered a range of initial pressures from 50 to 400 lb. per sq. in. (gauge). The second set of tables, published in 1925, extended the range of initial pressures from 400 lb. to 2,000 lb. per sq. in. The present set of tables extends the range up to 3,200 lb. per sq. in.

Subsequent to the publication of the 1925 tables, the late Professor Callendar, under the auspices of the British Electrical and Allied Industries Research Association, undertook measurements of steam values up to 4,000 lb. per sq. in. This research, in addition to yielding some extremely interesting data in the region of critical pressure, led to some small modifications in the Callendar steam equations in the region of high pressure. The heat drop values in the present volume have been calculated on the latest revised steam equations.

The initial pressure range is from 3,200 lb. down to 100 lb., and the terminal pressure range, as in previous tables, from 27 in. vacuum (30 in. barometer) to 29.5 in. vacuum. The temperature is given in terms of initial temperature, and goes up to 1,000 deg. Fahr. for all initial pressures. In previous tables the temperature was given in terms of initial superheat. As the Callendar steam tables are based on initial temperature also, the arrangement of the latest tables is preferable to the previous ones. A table covering heat drop for low pressure steam from 19 to 14 lb. absolute is included.

The tables are well arranged and the printing is all that can be desired. Engineers dealing with heat drop problems owe a great debt of gratitude to Professor Callendar's genius in placing steam values upon a firm and accurate basis, and also to Dr. Moss for producing the heat drop values in such a readily usable form.

Business and Industrial Notes

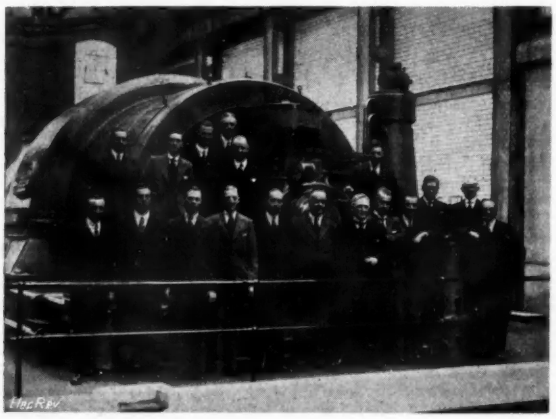
The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

"History Repeats Itself!"

Under this title Messrs. Berry, Wiggin & Co., Ltd., have reprinted a passage from a criticism by Lord Macaulay, written in 1830, when the country was suffering from the after-effects of the Napoleonic Wars. It is all of great interest, and particularly applicable to the present situation, but we can only find room for the following quotation:— "It is not by the intermeddling of . . . the omniscient and omnipotent State, but by the prudence and energy of the people, that England has hitherto been carried forward in civilisation; and it is to the same prudence and the same energy that we now look with comfort and good hope. Our rulers will best promote the improvement of the nation by strictly confining themselves to their own legitimate duties, by leaving capital to find its most lucrative course, commodities their fair price, industry and intelligence their natural reward, idleness and folly their natural punishment, by maintaining peace, by defending property, by diminishing the price of law, and by observing strict economy in every department of the State. Let the Government do this: the People will assuredly do the rest."

Electrical Contractors at Blackburn

The launching of Blackburn Corporation's assisted wiring scheme has brought the town's electricity officials and the Blackburn branch of the E.C.A. into close touch, and on October 1st they attended a luncheon following a visit to the Whitebirk power station. Mr. John Walsh (branch



Blackburn Contractors with the Chairman and the Borough Electrical Engineer

chairman), who presided, expressed the appreciation of the Association for the way they had been treated by Mr. W. A. Royle, the Corporation electrical engineer, since his appointment to Blackburn. They felt that it was because of his endeavours that the hire wiring scheme had been approved and private contractors were allowed to participate in the work. Councillor C. A. Critchley (chairman of the Corporation Electricity Committee) said the Blackburn station was more efficient than ever before in its history, their generating costs bearing fair comparison with those of other centres. Mr. T. Heys, secretary of the Blackburn branch, said that in the immediate future the contractors hoped to co-operate with the Corporation electricity department to make a success of the assisted wiring scheme.

Mr. Royle stated that the future success of the undertaking depended on the development of the domestic load, and obtaining additional household consumers in large numbers. He appealed for the co-operation of the contractors to obtain as good a class of consumer as possible; the future of assisted wiring depended on the success achieved in connecting up the initial 2,000.

The accompanying illustration shows the party during the inspection of the electricity works.

The Copper Cartel

The Brussels correspondent of *The Times* reports that at the end of October an international meeting of producers of copper will be held in New York to discuss the copper cartel founded five years ago. The arrangement needs further consideration, and the organisation has to be brought up to date. M. Francqui, who took an important part in the economic conferences of Geneva, will be present at the meeting.

German Radio Research Laboratory

It is reported from Berlin that the three leading German electrical and radio concerns—the Telefunken Co., the Siemens & Halske Co., and the Allgemeine Elektricitäts Gesellschaft (A.E.G.)—have decided on the establishment of a joint laboratory for research work in connection with radio apparatus.

Falk, Stadelmann's New Showrooms

MESSRS. FALK, STADELMANN & CO., LTD., have removed their Newcastle-upon-Tyne premises from Hanover Square, and have now opened more extensive showrooms at 3-11, Prudhoe Street, in the heart of the city. The entrance hall is finished in limed oak, tastefully decorated, leading directly into the main fittings showroom, where fittings of modern character are displayed. The heating section of this showroom includes a very comprehensive range of "Efesca" electric fires of modern design. The glassware showroom contains bowls and shades each wired up for display purposes. One showroom is exclusively allocated to the display of Rhodoid and bedroom

Falk, Stadelmann's Newcastle Showrooms

fittings, silk and vellum shades, and cut-glass standards. There is also a separate section for "Efesca" bathroom and cooking and domestic appliances, and a wireless section in which sets made by the company and other manufacturers are shown.

Commercial Electrical Travellers

The Electrical Trades' Commercial Travellers' Association is holding a dinner-dance on November 27th at the Criterion Restaurant, Piccadilly Circus, W., at 7 for 7.30 p.m. Tickets, 12s. 6d. each, can be obtained from Mr. C. W. Boyce, hon. secretary, 58, Canterbury Road, Harrow, Middlesex.

Ediswan Fittings at Olympia

The Edison Swan Electric Co., Ltd., was responsible for the decorative lighting at the recent National Radio Exhibition held at Olympia. The various designs (one of which is seen

Ediswan Lighting Fittings at the Radio Exhibition

in the accompanying illustration) were both original and artistic, and added considerably to the general attraction of the exhibition.

Faraday Celebrations at Ashford

During the current week an electrical exhibition has been held at Ashford, in conjunction with the local Faraday celebrations. On Monday last there was a luncheon arranged by the Ashford Branch of the E.A.W., followed by the inauguration of the exhibition. In addition to many well-known manufacturers, a number of local electrical concerns and Ashford Urban District Council Electricity Department have contributed to the display of electrical appliances which covers all electrical apparatus for use in the home. Additional attractions during the week have been an illuminated carnival parade, a carnival dance, and a boxing display.

Swedish Price Increases

As a result of the suspension of the gold standard in Sweden, and the consequent decline in the Swedish krone, the wholesale electrical firms in Stockholm have increased the prices of insulated conductors, installation materials and accumulators by 15, 15, and 20 per cent. respectively. According to the Stockholm representative of the Allmänna Svenska Elektriska A.B., the price advance applies to manufactures containing imported products such as copper, rubber, &c., as well as to such goods imported in a finished condition. It is added that the increase will also affect goods which are already in stock to a large extent.

The Polish Lamp Business

It is reported from Warsaw that the Soviet trading delegation in that city has granted to a local electrical firm the sole agency of the Russian Electrical Trust for the sale of Russian incandescent electric lamps in Poland in return for a deposit of 2,000,000 gold roubles. The lamps are to be sold in the Polish market at prices which are 30 per cent. lower than the Polish inland quotations. The Polish import duty on incandescent lamps was largely increased on September 26th. It is announced that the German Osram Lamp Company of Warsaw has decided to establish its own glass works, owing to the Polish increase in duties on semi-products, including glass bulbs, which have hitherto been obtained from Germany.

St. Vincent Import Duties Increased

An Ordinance, dated July 7th last, increases the import duty on electrical apparatus for illuminating or communicating purposes imported into the island of St. Vincent, British West Indies, from 5 to 10 per cent., under the general tariff, and imposes a duty of 5 per cent. on such products when imported from countries in the British Empire.

New French Companies

Among the new companies recently formed in France are the Société Deliot & Cheminat, Paris (12, Rue de Palestine), to manufacture electrical furnaces; the Société des Lampes de France, Sevres (21 bis, Rue du Docteur Gabriel Ledermann), to manufacture electric lamps and radio valves; the Société Union Sonore Européenne, Paris (55, Avenue des Champs Elysées), to acquire certain rights from Mr. Malcolm Lyon, of London, and to engage in the radio telephony industry, and the ociété des Industries Electrotéléphoniques (S.I.E.T.), Paris (36, Avenue Hoche), capital one million francs.

Australian Wiring Rules

His Majesty's Trade Commissioner at Sydney has forwarded to the Department of Overseas Trade a copy of the Australian Standard Rules covering the essential requirements and minimum standards governing electrical installations for buildings, structures, and premises. A copy of the rules is available for loan to interested British firms in order of application. Firms desiring to purchase a copy for their own use can, it is understood, obtain one from the Accounts Branch, Office of the High Commissioner for Australia, Australia House, Strand, London, W.C.2.

A New "Northmet" Showroom

The North Metropolitan Electric Power Supply Co. has recently opened a new showroom at Cheshunt. This is the seventeenth showroom which the company has opened.

Electricity Supply in the Lothians

An interesting little booklet has recently been published by the Lothians Electric Power Co, recording its activities in its area of supply. There are some excellent photographs included of the company's distributing centres, and a map shows the area supplied and the routes of the transmission lines. A chapter is devoted to electro-farming, while the various domestic applications of electricity are dealt with in detail. A schedule of charges is appended, together with a brief review of the company's personnel.

The Venezuelan Radio Market

The American Vice-Consul at La Guaira states that, with the removal of restrictions, the Venezuelan radio market has shown rapid development recently. The makes of sets now on the market are of British, American, Dutch, and Canadian origin, but a serious handicap at the moment is the lack of skilled service men for repairing sets and the inability to secure spare parts at reasonable prices. In order to get the best results in Venezuela, a receiver capable of receiving both long and short waves is required.

Wages in the Electricity Supply Industry

In our last issue (p. 521) we summarised the contents of two letters setting forth the views of the employers' side of the National Joint Industrial Council for the Electricity Supply Industry and recommending reductions in wages. We have now received a copy of a letter, signed by Messrs. James Rowan & G. P. Dean, expressing the case of the employés' side of the Council. In this, exception is taken to a recommendation going forward that has not been approved by a majority of each side of the Council, and it is stated that the correct procedure was to refer the cause of difference to the District Joint Councils. Only in the event of failure of the latter to reach an agreement should the question be referred to the National Council. The signatories object to the figures included in the employers' letter, and say that no reference is made to "super-cut" enforced in 1922, "which mulcted the workmen in the industry of many thousands of pounds a week for nearly a year." The large profits of the industry are commented on, and it is maintained that the wage reduction suggested would only decrease production costs by one-five-hundredth of a penny per kWh. In conclusion, it is claimed that the employers' action is *ultra vires*, that the financial reasons given for a reduction are inadequate, and that the cost-of-living index does not represent the true position of affairs.

In commenting on this letter, Mr. A. H. Banks, the employers' industrial adviser, maintains the right of the employers' representatives to communicate with their constituents, and it is pointed out that this communication was made on behalf of the employers' organisation and not in the name of the National Council. The statement of the employés' representatives regarding the reference of such questions to the District Councils is said to be a mis-statement of fact. The "super-cut" referred to is said to have been an agreed reduction, which still maintained wages at 89 per cent. above 1914 rates, as compared with a general level of 67.5 per cent. It is suggested that the employés' representatives have ignored the great number of men engaged in the distribution side in calculating the effect of the proposed wage reduction upon costs; and it is reiterated that wages in the industry will still be 20 per cent. above the general level when the reduction is imposed. A final note refers to the persistent refusal of the Unions to arbitrate in this matter.

Recent Contracts

The L.N.E.R. has placed a contract with the British Power Railway Signal Co., Ltd., for the resignalling of 30 miles of the main east coast tracks between York and Northallerton. The contract includes the supply and installation of the latest type of automatic and controlled searchlight and colour light signals and d.c. track circuits with phase adjustment on the stretch of line which consists of three and four tracks. Also included is a power signalling installation at Thirsk with remote control. The whole of the material to be used will be of British design and manufacture. The British Power Railway Signal Co., Ltd., will obtain part of the apparatus from the Siemens & General Electric Railway Signal Co., Ltd., and cables from Messrs. Siemens Bros. & Co., Ltd.

BRITANNIA BATTERIES, LTD., have recently completed the installation of a 230-V battery for the emergency lighting of the Usher and Synod Halls, Edinburgh. They also supplied the motor generator and switchboard.

MESSRS. DAVEY, PAXMAN & CO., LTD., have received from Messrs. Drake & Gorham, Ltd., an order for five of their latest totally-enclosed heavy-duty oil engines for the Prudential Assurance Co., Ltd. Each engine is of six cylinders, and will be direct-coupled to a 200-kW generator.

Recent orders received by the ALTON BATTERY CO., LTD., include central station battery renewals for Great Grimsby Street Tramways Co., Ardee Electric Co., Ltd., Horsham U.D.C. Electricity Department, Dromore Electric Light and Power Co., Ltd., and orders for new batteries from the War Office (for shipment to Jamaica), the Central Electricity Board and the British Broadcasting Corporation. The B.B.C. contracts cover twenty-one batteries, thirteen for the Scottish regional station and eight for Broadcasting House, Edinburgh.

Trade Announcements

The VINCENT SWITCHGEAR MANFG. CO., LTD., has appointed Mr. J. L. Dawson, of 12, Linenhall Street, Belfast, as its representative for Northern Ireland.

THE UNIVERSAL LIGHTING CO., LTD., of 7, High Street, Clacton-on-Sea, has opened showroom premises for the radio department in the Arcade.

MR. W. DAVISON, lately in partnership with Mr. W. W. Garrod, has commenced business as an electrical engineer and contractor at Orwell Road, Clacton-on-Sea, trading as W. Davison & Co.

Czecho-Slovakian Electrical Trade

The British Commercial Secretary at Prague reports, according to the *Board of Trade Journal*, that the value of imports of electrical machinery and tools into Czecho-Slovakia during August last amount to 16,842,000 crowns, while the total value for the eight months ended August last was 167,846,000 crowns. The values of exports of electrical machinery and tools for the same periods were 16,446,000 crowns and 72,571,000 crowns respectively.

School of Engineering and Navigation, Poplar

H.R.H. Prince George will open the extension of the L.C.C. School of Engineering and Navigation, in High Street, Poplar, at 4 p.m., on October 21st.

Book Notices

"The Electrical Contractors' Year Book, 1931-32." Pp. 512. London: The Electrical Contractors' Association (Inc.). Price 5s.—This publication is so well known that little introduction is necessary. In addition to the lists of members of the E.C.A., the National Electrical Contractors' Trading Association and the National Federated Electrical Association, their officials and their objects, there are sections dealing with the legal aspects of electrical contracting, rates of pay, and working rules in the various districts of the country. The annual report of the Association and the presidential address are also reproduced, as well as a list of the central stations of the United Kingdom. The book is one which the electrical contractor or, in fact, anyone concerned with the electrical industry, can ill afford to be without.

"Practical Railway Operating," by T. Bernard Hare. Pp. 168; diagrams. London: Modern Transport Publishing Co., Ltd. Price 5s. net.

We have received a copy of the first issue of the *Steam Engineer* (October, 1s.), a monthly journal devoted to reducing fuel costs. It is published by Messrs. John D. Troup, Ltd., of 34-35, High Holborn, W.C.1.

Local Exhibition

Every year Rochdale holds an exhibition, with the object of stimulating local trade. One of the most attractive stands at the recent exhibition was that of the Rochdale Corporation Electricity Department, in co-operation with the General Electric Co., Ltd., Credenda Conduits Co., Ltd., Burco Wash Boiler Co., the Hotpoint Electric Appliance Co., Ltd., and W. E. Beardsall & Co. Five stands constituted the exhibit, which comprised electric cooking, washing, ironing, and cleaning apparatus, hot-water supply systems, and electric light fittings of the latest design. Other electrical exhibitors were: A. S. Howarth, Ltd., Friar & Hartley, and Rochdale Community Radio, Ltd.

The Polish Radio Market

The *Chamber of Commerce Journal* states that during 1930 Poland imported radio apparatus (excluding valves, batteries, and transformers) to the value of approximately £185,500, as compared with £159,800 in 1929. Valves were imported last year to the value of approximately £70,700, an increase of £16,500 over the figure for 1929. Germany is by far the most important supplier to the market, furnishing last year 50 per cent. of the total imports, or 11 per cent. more than in 1929. There is a local industry for the manufacture of sets and various parts and accessories, and in 1929 the value of the output was estimated at £300,000. The best organised branch of the local industry is that for the manufacture of dry batteries, and, with the exception of certain chemicals which must be imported, the whole of the materials used in this branch of the industry are of domestic origin. In the retail trade the instalment system is largely practised. The terms granted to the wholesale and importing trade are three to six weeks' open account, or three or four months' credit covered by promissory notes.

Polish Electrical Imports

According to the *Board of Trade Journal*, the imports of conductors, apparatus, and other electrical materials into Poland during the month of July attained a value of 3,226,000 zloty.

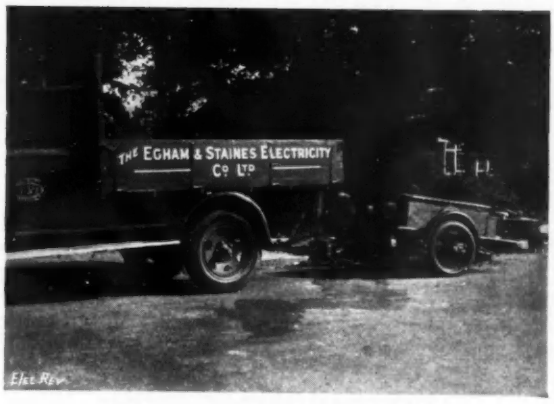
A Lancashire Window Display

During the recent Faraday celebrations the Lancashire Electric Power Co. had a special window display at its Chorley showrooms, showing the development which has taken place in domestic comfort during the past century by the introduction of electricity in the home. As will be seen from the accompanying illustration the display was a variation of the E.D.A. Faraday window suggestion, and it attracted considerable attention.

The Lancashire Power Co.'s Faraday Display

Trailers for a Supply Company

The Egham and Staines Electricity Co. recently purchased from Messrs. Bruce & Holroyd, Ltd., a number of trailers which are used for outside linesmen's work, towed behind their motor lorries in place of the old-fashioned hand carts.



A Trailer for Electricity Supply Work

The vehicles have saved a considerable amount of time as they are light and easily transported at high speed. They are capable of carrying loads up to 10 cwt. One of the trailers is shown in the accompanying illustration.

Receiver Appointed

SHOREDITCH WOOD TURNING CO., LTD., floor standard manufacturers, Drayton Park, N.5.—Mr. W. Wilkin has been appointed receiver and manager of this company on behalf of a debenture holder.

An Electric Fountain for Brighton

The inauguration will take place this evening, at Victoria Gardens, Brighton, of a spectacular electric fountain lent to the town by the British Thomson-Houston Co., Ltd. A dinner is being given at the Royal Pavilion, Sir Felix Pole and Mr. H. A. Lingard, directors of the company, acting as hosts. The Mayor, Alderman S. C. Thompson, J.P., and several other Corporation officials, have promised to be present. The "Mazda" fountain has been operated experimentally for short periods on several nights during the past few weeks and has created considerable interest. A number of concealed floodlight projectors, fitted with colour media and controlled by means of a motor-driven flasher, throw their beams on the rising and falling jets, and the sparkling colours produced by

The "Mazda" Electric Fountain

the combination of coloured lights and moving water give a singularly beautiful effect. Each projector is fitted with a 1,000-watt "Mazda" gasfilled projector lamp, and there is also a bank of lamps around the upper edge of the fountain. The latter serve to illuminate the cascade of water which overflows from the upper basin into the lake. All the other apparatus is contained in the cylindrical body of the fountain. The switchgear for controlling the motor and lights is contained in a kiosk on the pavement a few yards away. The actual erection of the fountain, including the wiring and electrical work, was carried out by Mr. W. N. C. Clinch, the Brighton electrical engineer, and the Corporation Electricity Department.

New Catalogues and Lists

The "CAPSTAN" GAUGE CO., 30, Abbey Road, Brighton.—Particulars of various types of gauging machines.

The BENJAMIN ELECTRIC, LTD., Tariff Road, Tottenham, N.17.—A leaflet dealing with the new "Reflector" cleaning paste. Also a brochure on lighting in the leather industry.

The CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1.—An illustrated leaflet on panel mounting equipment.

The DRAYTON REGULATOR & INSTRUMENT CO., LTD., West Drayton, Middlesex.—A folder describing the "V.T." temperature regulator.

The WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., 82, York Road, King's Cross, N.1.—A booklet on building h.t. and l.t. battery eliminators and chargers with metal rectifiers.

A. J. ASHDOWN, LTD., 119, Victoria Street, Westminster, S.W.1.—A pamphlet giving particulars of the new "C" type rotoscope.

The AEROGRAPH CO., LTD., 43, Holborn Viaduct, E.C.1.—A leaflet illustrating and describing finishing equipment for electrical plant and accessories.

ELLIOTT BROTHERS (LONDON), LTD., Century Works, Lewisham, S.E.13.—A descriptive leaflet of a deflectional-type frequency indicator.

The EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4.—Publications H.C.692, H.C.704, and C.L.708, dealing respectively with domestic electrical appliances, fires, and commercial lighting fittings.

ANDREW PAGE & SON, LTD., 99, Albion Street, Leeds.—Particulars of the "O.K." vacuum cleaning brush.

The MULLARD WIRELESS SERVICE CO., LTD., Charing Cross Road, W.C.2.—A two-colour poster and a wall valve chart.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, W.C.2.—Folder 5553, giving prices and particulars of "Elasta" electric lamps. Also a calendar-blotter for October.

BERKELEY & YOUNG, LTD., Tyseley, Birmingham.—List No. F.P.931, dealing with fume-proof electric fans.

The MIDLAND ELECTRIC MANUFACTURING CO., LTD., Birmingham.—Catalogue 190, illustrating and describing the company's complete range of switch- and fuse-gear.

CROMPTON PARKINSON, LTD., Bush House, Aldwych, W.C.2.—A leaflet giving details of the new "Klad" circuit breaker.

JOHN DUGDILL & CO., LTD., Hazel Grove, near Stockport.—A catalogue of movable, focusing, and self-sustaining fittings for all purposes.

The BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—The new season's "Mazda" lamp catalogue.

CHARLES H. CHAMPION & CO., LTD., 14-17, Wells Street, W.1.—A booklet containing information upon the functions and operation of "Hilo" carbons.

LOUIS HOLZMAN, LTD., 37, Newman Street, W.1.—Leaflets Nos. 502, 513, and 520, dealing respectively with condensers for the elimination of interference, condensers for single-phase induction motors, and high-voltage condensers for smoothing purposes.

MAVOR & COULSON, LTD., Glasgow.—A booklet issued in connection with the company's jubilee celebrations.

DEXINE, LTD., Abbey Lane, Stratford, E.15.—Folders illustrating "Dexonite" ebonite and "Dexine" products generally.

EDISON STORAGE BATTERY DISTRIBUTORS, LTD., Victoria House, Southampton Row, W.C.1.—A catalogue demonstrating how an "Edison" battery is made and its various uses.

HUGH J. SCOTT & CO. (BELFAST), LTD., Volt Works, Ravenhill Avenue, Belfast.—A folder giving prices and particulars of electric motors and generators.

DRAKE & GORHAM WHOLESALE, LTD., 77, Long Acre, W.C.2.—Pamphlet 500, giving particulars of the new season's fires and other domestic appliances.

A. REYROLLE & CO., LTD., Hebburn-on-Tyne.—Several new publications relating to switches, plugs, switchgear, &c.

The LONDON ELECTRIC WIRE COMPANY & SMITHS, LTD., Church Road, Leyton, E.10.—The new season's radio catalogue and a book of blueprints.

TURNER'S ASBESTOS CEMENT, LTD., Trafford Park, Manchester.—An illustrated catalogue of "Sindanyo" asbestos electrical insulators.

The ELECTRICAL EQUIPMENT & CARBON CO., LTD., 107-111, New Oxford Street, W.C.1.—A booklet (KP.7) giving details of overhead line fittings.

L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—A leaflet illustrating "Directolite" store lighting fittings. Also the October issue of the "Link."

Electricity in the Home

An attractive little booklet has just been produced by Messrs. Johnson & Phillips, Ltd., entitled, "How to Have Your House Wired." With the aid of excellent coloured illustrations, are shown numerous ways in which the "J. & P." wiring system can be utilised to bring beauty, comfort, and cleanliness into the modern home. Each room is dealt with separately, and suggestions are given as to the various electrical appliances which can be used, together with hints on decoration and furnishing. A description of the "J. & P." system is also included.

For Sale

Pontypridd Urban District Council invites offers for the purchase and removal of seventeen double-deck tramcars, etc.

(See our advertisement pages to-day.)

Condensers for Battersea Power Station

With regard to the note which appeared in our issue of September 25th (p. 471), the Yorkshire Copper Works, Ltd., informs us that it has supplied the whole of the condenser tubes required for the new condensers being installed at the Battersea power station.

United States Electrical Exports

During July the value of electrical equipment exported from the United States amounted to $7,269,833, as compared with $9,520,917 in July, 1930. For the first seven months of the year the total was $57,764,229, as against $81,094,136. Large declines were recorded in almost all sections, the items most seriously affected being: D.c. generators, from $78,442 to $17,516; a.c. generators, from $110,433 to $37,973; steam turbine generator sets, from $188,541 to $63,610; batteries, from $603,642 to $441,099; transformers, from $367,523 to $47,311; power switches and circuit breakers (over 10 A), from $161,959 to $40,817; fractional h.p. motors, from $298,237 to $159,909; portable electric tools, $127,063 to $70,193; fans, from $55,872 to $33,563; telephone apparatus, from $378,121 to $120,268; bare copper wire, from $172,359 to $38,625; and insulated copper wire and cable, from $355,069 to $190,200. The only outstanding increases occurred in railway motors (from $2,512 to $49,042), refrigerator parts (from nil to $266,730), industrial electric furnaces, ovens, &c. (from $33,663 to $266,321), radio transmitting and receiving sets (from $817,684 to $1,030,297), and porcelain (from $37,191 to $94,088). Canada, the United States' principal customer, took equipment to the value of $1,475,083, the United Kingdom ($830,365) occupying the second place. Argentina with $468,316 was third on the list.

Imports of electrical equipment into the United States at $280,418 were $106,270 higher than last year. The principal items were lamps ($158,397) and vacuum cleaners from Sweden ($71,028).

Irish Free State Electrical Imports

A very quiet tone continues to exist in the electrical trade in the Irish Free State, the imports of machinery and cognate apparatus during July last having amounted to a value of £49,798, bringing the total for the first seven months of the year to £373,250, a decrease of £159,520 as compared with the corresponding period of 1930. Details of the seven months' imports are appended:—

	January—July. 1931.	1930.
	£	£
Electrical machinery	115,877	187,898
Electric wires and cables	54,744	106,123
Electric lamps and parts	35,720	52,884
Radio sets and parts	51,863	47,825
Other electrical goods	104,301	113,149
Copper wire	13,745	24,891
Totals	£373,250	£532,770

It will be noticed that radio goods constitute the only item showing an increase.

A "Faraday" Golf Cup

In connection with the Faraday Centenary celebrations in Hull, the opportunity was taken of forming a small committee with Mr. J. N. Waite, the city electrical engineer, as chairman, and Mr. H. E. Turner as hon. secretary, with a view to organising a golf competition. It was arranged that a cup should be presented, named the "Faraday Centenary Golf Cup," to be competed for annually and open for competition to anyone engaged in the electrical industry in Hull and the East Riding of Yorkshire. The competition, medal play, took place on September 29th, and was won by Mr. G. A. Vowles, of the Hull Corporation electricity works. It has been decided that the entrance fees from this competition shall be devoted to the funds of the Electrical Trades Benevolent Institution.

London Travellers' Dinner Postponed

In view of the present financial situation and the fact that a General Election is taking place very shortly, it has been decided to postpone the forty-fourth anniversary festival dinner of the London Commercial Travellers' Benevolent Society, which had been fixed for October 22nd, until the early part of the New Year.

Faraday Celebrations at Aylesbury

In addition to a local Faraday exhibition and illuminations, the Aylesbury Corporation Electricity Department conducted a party of school children round the electricity works and showrooms, and entertained them to a cinema display on the uses of electricity.

Prices of Materials

Messrs. F. Smith report October 7th: Electrolytic copper bars (best selected), sheets and wire rods, nominal; ditto, h.c. wire, 7 3/16d., ¼d. inc.; Silicium bronze wire, 8 11/16d., 3/16d. inc.

Messrs. Edward Till & Co., report, October 7th: India-rubber, Para fine, 3⅝d., ¼d. inc.

Messrs. James & Shakespeare report, October 7th: Copper bars (best selected), sheet and rod, no change. English pig lead, £14 5s., £1 10s. dec.

Bankruptcy Proceedings

S. G. Brackenbury, wireless and electrical engineer, lately carrying on business at 35, South End Road, Hampstead, N.W.—A sitting of the London Bankruptcy Court was held on September 29th before Mr. Registrar Mellor for the public examination of this debtor who failed last July with liabilities of £1,218 against assets of £9. The debtor attributed his failure and insolvency to lack of working capital and consequent restricted credit, depreciation of the business during illness, competition, pilfering, and law costs. The examination was concluded. The following are the principal creditors:—J. B. Neale, Ltd., £137; Rangers, Ltd., £45; Mrs. A. B. Brackenbury, Oxford, £440; Orchorsol Grams, Ltd., £74.

C. Foulston, motor and electrical engineer, 18, Wollaston Road, late Mill Road Garage, both Cleethorpes.—This debtor appeared at the Town Hall, Great Grimsby, on October 1st for his public examination. A statement of affairs was presented which disclosed gross liabilities of £289, all of which were expected to rank for dividend. The deficiency amounted to £256. Debtor attributed his position to "bad trade and heavy County Court costs." An execution was levied on March 21st of this year, and debtor ceased business. The examination was adjourned.

P. M. Braidwood, electrical engineer, late of 37, Blackstock Road, Finsbury Park, N.—The public examination of this debtor was held and concluded on September 29th before Mr. Registrar Mellor at the London Bankruptcy Court, the accounts showing liabilities of £520 against assets of £52. The debtor attributed his failure and insolvency to lack of working capital, general trade depression, and heavy advertising expenses.

W. F. O. Sawell (Commercial Electrical Co.), electrical engineer, 24, James Street, Bradford.—Application for discharge to be heard on November 10th at the County Court, Manor Row, Bradford.

C. M. Anderson (Robin Hood Electrical Co.), electrical contractor, 1556, Stratford Road, Hall Green, Birmingham.—Trustee: Mr. C. Hoult, 191, Corporation Street, Birmingham, Official Receiver, released September 15th.

V. R. Shewan and A. L. Grace (Avon Radio Manufacturing Co.), wireless manufacturers, Long Ashton.—First and final dividend of 10½d. in the £, payable October 7th at the Official Receiver's offices, 26, Baldwin Street, Bristol.

A. S. Heslop, radio engineer, &c., 24, Park Place East, Sunderland.—First and final dividend of 5d. in the £, payable October 3rd at the Official Receiver's offices, 14, John Street, Sunderland.

J. T. Lord, electrical engineer and contractor, Commercial Buildings, Oakworth, nr. Keighley.—Last day for receiving proofs for dividend, October 17th. Trustee, Mr. J. O. Morris, 12, Duke Street, Bradford, Official Receiver.

S. E. B. Hunt, electrical engineer and contractor, 8a, Torwood Street, Torquay.—Last day for receiving proofs for dividend, October 16th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

W. Adams (Electrovacs), electrical engineer, 17b, Prince of Wales Road, Battersea, S.W.—First and final dividend of 5s. in the £, payable October 12th at 4, Charterhouse Square, E.C.

D. C. Luen, wireless dealer, 78, High Street, Barry.—First and final dividend of 8s. 3d. in the £, payable October 8th at the Official Receiver's Office, 34, Park Place, Cardiff.

F. W. Cassell (F. W. Cassell & Co.), electrician, 164, Park View Road, Welling.—First and final dividend of 1s. in the £, payable October 12th at the Official Receiver's offices, 280a, High Street, Rochester.

Company Liquidations

Eltax (British), Ltd., Hayden's Place, Portobello Road, W.—The accounts filed under the compulsory liquidation of this company show unsecured liabilities of £7,167 and loans on debentures of £204; assets of £179; and a deficiency of £8,192, with regard to contributories, the issued capital consisting of 1,000 ordinary shares of £1 each. The Official Receiver, who also acts as liquidator, reports that the company was formed in November, 1928, to manufacture, sell, and deal in all kinds of radio apparatus. Mr. W. E. Stichling, a director, states that the Langham Electrical Co., Ltd., was the agent of a German company, called Eltax Electro G.m.b.H., of Berlin, manufacturers of electric batteries and radio apparatus. In July, 1928, however, the Eltax Company of Berlin decided to form a new company in this country for the manufacture of batteries, the materials for which should be supplied direct from Germany. In the following November the company was formed and carried on a wholesale business only. It found, however, that the costs of the materials supplied by the German company were excessive, and the trading resulted in a gross loss for the whole period of £1,334, and a net loss of £6,366. In July, 1930, the German suppliers were unable to finance the company's requirements, and all supplies to this country were stopped. The company was obliged, therefore, to purchase certain materials locally, and the directors found that by manufacturing the complete article in this country it was possible to sell the company's products at a profit. The directors attribute the failure of the company to the excessive prices paid for materials supplied by the German company and to insufficiency of working capital.

South Wales Power Co., Ltd.—Winding-up voluntarily. Liquidator, Mr. D. H. Allan, 4, Fenchurch Avenue, E.C.

Basson Electrical Co., Ltd.—Meeting, October 30th, at 10, Norfolk Street, Manchester, to receive an account of the winding-up by the liquidator, Mr. F. Harrop.

Rhayader Electric Light & Power Co., Ltd.—Meeting, November 2nd, at the Lion Royal Hotel, Rhayader, Radnor, to receive an account of winding-up by the liquidator, Mr. J. Stephenson.

Newcastle Emlyn and District Electric Supply Co., Ltd.—Meeting, October 29th, at Central House, Kingsway, W.C.2, to receive an account of the winding-up by the liquidator, Mr. J. W. Davies.

Central Electric Development Co., Ltd.—Meeting, October 29th, at Emlyn Works Offices, Newport, Mon., to receive an account of the winding-up of the company by the liquidator, Mr. C. Chapman.

Electricity Supply

Lighting, Domestic, Power

Barking.—EXTENSIONS.—The Urban District Council Electricity Committee is to extend mains and provide a sub-station at a cost of £1,796 to supply the factory of Messrs. Scoffin and Willmott in the by-pass road.

Barnstaple.—SPECIAL ORDER.—The Town Council has decided to apply for a Special Order authorising it to supply electricity to the parishes of Tawstock and Fremington.

Bath.—SUPPLY TO UPPER SWAINSWICK.—The Corporation Electricity Committee has recommended that a supply of electricity should be given to Upper Swainswick by an overhead line at an estimated cost of £2,225. The proposed charges are 30 per cent. above those in the city until the revenue amounts to £200 per annum, when this increase would be lowered to 20 per cent. The Minister of Health has sanctioned the acquisition of the site of the Full Moon Hotel for the provision of electricity showrooms and offices.

Bishop Auckland.—MAINS EXTENSIONS.—The Durham County Council Public Assistance Committee has authorised mains extensions at the Bishop Auckland Colony at an estimated cost of £600.

Blackpool.—BREAKDOWN.—The breaking of an overhead tramway wire on October 1st caused a short circuit which cut off the electricity supply to the Promenade and a portion of the central area for about half an hour.

Colne.—LOAN FOR MAINS.—The Town Council has decided to apply for sanction to a loan of £7,950 for prospective expenditure on mains and services during the next two years.

Dover.—MAINS EXTENSIONS.—The Corporation Electricity Committee recommends the borrowing of £2,000 for mains extensions.

Durham.—LIGHTING OF SCHOOLS.—The County Education Committee is to install electric lighting in the following schools:—Dunston Hill, Crookgill, Blaydon East, Dunston, Marley Hill Colliery, Whickham, Greenside, Emmaville, Wirdaton, and Marley Hill Council Schools. Mr. Willey, 34, Old Elvet, Durham, is the Committee's architect.

Easingwold (Yorks.).—PURCHASE OF ELECTRICITY UNDERTAKING.—The Cleveland and Durham Electric Power Co., has purchased the electricity undertaking at Easingwold, established in 1925 by Messrs. J. C. Bannister & Co., Ltd., who have controlled the supply up to now.

Eastbourne.—LOAN.—The Corporation Electricity Committee is to apply for sanction to a loan of £16,545, the estimated cost of completing the supply of electricity in all the parishes included in the 1931 Order with the exception of Hailsham, East Dean and Friston.

East Elloe (Lincs.).—SUPPLY TO WHAPLODE.—The Boston and District Electricity Supply Co., Ltd., has informed the Rural District Council that a supply of electricity will be given to Whaplode by way of Holbeach provided that facilities for overhead lines are given by landowners and tenants; otherwise the matter will have to be abandoned.

Gatehouse.—SUPPLY INAUGURATED.—The Town Council has completed a scheme for lighting the burgh by electricity. The supply, which is provided by the Dalbeattie Electric Light and Power Co., Ltd., was switched on by Provost M'Cutcheon on September 25th.

Glasgow.—MAINS EXTENSIONS.—The Corporation Electricity Committee recommends the laying of distributing mains at a cost of £12,462.

Grampians.—SUPPLY EXTENSIONS.—A start has been made by the Grampians Electricity Supply Co., Ltd., with the laying of the cable between Callander and Aberfoyle, and electricity for lighting is expected to be available about the beginning of next year. From Aberfoyle the cable is to be carried through Gartmore to Balfron and Killearn. A petition is being prepared in Balfron with a view to the formation of a special lighting district to take advantage of the Grampian scheme.

Haslingden.—YEAR'S WORKING.—The total revenue of the Corporation electricity undertaking for the past year was £21,922, the working expenditure amounting to £14,783. The net profit fell slightly from £1,558 to £1,414.

Hornsey.—LIGHTING OF COUNCIL HOUSES.—The Corporation has obtained sanction to the borrowing of £1,250 for lighting Council houses by electricity.

Hull.—BREAKDOWNS.—At a recent meeting of the Corporation Electricity Committee, the engineer reported with regard to the breakdowns which had occurred at the electricity station and the steps taken in connection therewith. The Committee decided to ask the Central Electricity Board to receive a deputation with regard to the Council's application for permission to extend the plant at the station.

HIRE AND HIRE-PURCHASE OF APPARATUS.—The Corporation Electricity Committee has decided to allocate a further £25,000 from the reserve fund for the hire and hire-purchase of domestic apparatus.

Isle of Wight.—POWER PLANT FOR INSTITUTION.—The Mental Hospitals Committee has applied to the County Council for sanction to the expenditure of £450 for the purchase of power plant for the mental hospital at Whitecroft.

Japan.—New Power Stations.—The first section of the Government's Shinano-gawa 40,000-kW power station has now been commenced. The whole scheme is expected to take six years to complete. The new Kawasaki station of the I.G.R. was put into operation last month.

Kingsbury (Staffs.).—Public Lighting.—The Parish Council has accepted the tender of the Tamworth District Electric Supply Co., Ltd., for the public lighting of Dosthill, Kingsbury, Hurley, and Wood End.

London.—Hackney.—The Borough Council Electricity Committee recommends that a temporary bulk supply of electricity should be given to the Central Electricity Board.

Maidenhead.—Supply to Hurley.—The Electricity Commissioners have communicated with the Town Council with regard to a supply of electricity for the village of Hurley, which is not at present within the authorised area of supply of any undertaking. The borough electrical engineer is of opinion that the extension might possibly be made to certain parts of the parish, and the Electricity Committee has directed that the extent of the demand for electricity in the belt of country which contains the villages of Hurley, Burchetts Green, Woolley Green, Littlewick Green, and White Waltham, should be ascertained, with a view to determining whether or not the Council should apply for powers to supply electricity in part of the unallocated territory.

Mansfield.—Rewiring of Library.—The Corporation Library Committee has decided to renew the electrical installation at the public library.

Mayfield (Sussex).—Public Lighting.—The Parish Council has accepted the tender of the Weald Electricity Supply Co., Ltd., for the public lighting of the village.

Morecambe.—New Feeder Cable Advised.—At a meeting of the Corporation Electricity Committee held recently it was reported that the Central Electricity Board had advised the provision of an additional feeder cable from the power house at Lancaster to a sub-station within the borough, the cost being estimated at £6,500.

Newcastle-on-Tyne.—Electrification Scheme.—The Newcastle-upon-Tyne Electric Supply Co. and its subsidiaries have under consideration a scheme for the electrification of an area of about 150 square miles in the southern part of North Yorkshire. This will cover the Vale of Pickering, and extend from Gilling East to Ampleforth, embracing the towns of Pickering, Easingwold, Helmsley, and Kirby Moorside.

Northampton.—Mains Extensions.—The Northampton Electric Light & Power Co., Ltd., is to lay mains in Birchfield Road to a sub-station to be erected in the vicinity.

Northern Ireland.—Belfast.—The Corporation has received sanction to the borrowing of £202,000 for mains and services for the two years ending March, 1933.

Peterborough.—Electricity for Council Houses.—The Rural District Council has received sanction to a loan for providing electricity for lighting in Council houses.

Preston.—Year's Working.—In his annual report on the working of the electricity undertaking during the past year, Mr. J. F. Simpson, borough electrical engineer, states that the reduction in the sales of energy for power in Preston and district (from 13,158,270 to 11,213,808 kWh), due to the general state of trade and the closing of the Dick, Kerr Works, has been more than counterbalanced by the increase in sales for domestic purposes, which have increased by 58 per cent. from 7,569,709 to 11,984,270 kWh. These figures, Mr. Simpson adds, prove that a suitable tariff combined with facilities for the hire or hire-purchase of cookers and other domestic apparatus will secure an almost unlimited market not so susceptible to fluctuations, due to trade conditions, as the power demand, which is usually considered to be the principal source of revenue in industrial undertakings. The total sales of energy increased from 77,732,262 to 92,183,272 kWh, bulk supplies increasing from 50,300,900 to 61,728,562 kWh. New consumers to the number of 2,946 were connected during the year, making the total at March 31st 17,224. Good progress was made with the change-over of the system of supply from d.c. to a.c. in the central area, and approximately half of the consumers have now been changed over. A direct supply was inaugurated to Lytham St. Annes on March 25th last. Alterations at the Ribble power station are in progress, and when completed will increase the installed capacity of the station to 60,000 kW. Financially, the Department had a very successful year. Revenue showed an increase from £256,548 to £304,210, while working expenses totalled £144,417 as against £130,256 in the preceding year. The gross profit rose from £126,292 to £159,792, to which was added income from other sources, making a total of £164,420 available. After providing for interest and loan charges amounting to £138,541 and contributing a sum of £8,281 to the capital outlay, there remained a net surplus of £17,598, which compares with £7,327 in 1929-30. On capital account a sum of £172,599 was expended, raising the amount invested in the undertaking to £1,919,366, in addition to which £25,743 is owing under the assisted-wiring agreement.

Price Reductions.—Reduction in the charges for electricity have been made or recommended in the following districts:—

Wrexham.—Lighting: From 5½d. per kWh for the first 1,000 kWh per quarter to 4½d. per kWh for the first 1,500 kWh per quarter. Two part tariff: Fixed charge reduced from 20 to 15 per cent. of the rateable value.

Falkirk.—Shops: All energy consumed beyond 600 hours' use of maximum demand to be charged at 1½d. per kWh, instead of 2d. Small power maximum demand rate: All extra 1d. per kWh, instead of 1½d. Domestic lighting and heating: Over 40 kWh per room, ½d. per kWh, instead of ¾d. A reduction is also to be made in cooker rents.

Wimbledon.—Domestic power: From 1d. to ¾d. per kWh during the six winter months; the present charge of ½d. per kWh during the six summer months, and ½d. per kWh for the first 360 kWh in each of the two winter quarters when an electric cooker is used, remains unaltered. Industrial power: From 1d. to ¾d. per kWh. Standard cooker rentals: Reduced by 1s. d. or 1s. per quarter, according to size.

Retford.—Extensions.—The Town Council has received sanction to a loan for electricity extensions in the northern area.

Sheffield.—Mains Extensions.—The Corporation Electricity Committee is to extend mains at a cost of £5,260.

Shipley.—Free Wiring.—At a recent meeting of the Urban District Council Electricity Committee, the electrical engineer asked for instructions regarding the limit of free wiring for the installation of electrical apparatus. It was decided that 30 ft. should be allowed in the case of apparatus purchased outright and on hire-purchase terms, and that the sum of £2 should be added for the cost of wiring in the case of apparatus on simple hire.

Change-over.—The Electricity Committee has approved plans for the completion of the change-over in the Bradford Road and Kendall Avenue areas at a cost of £5,489.

New Meters.—The Electricity Committee has decided to provide new meters for three-phase power consumers.

Lighting of Victoria Hall.—A scheme for the electric lighting of Victoria Hall at an estimated cost of £250 has been approved by the Urban District Council Libraries Committee.

Stalybridge.—Extensions.—The Electricity Committee of the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board has prepared a scheme for the extension of its cables to New Delph, Grotton, and Hazel Grove.

United States.—Combined Natural Gas and Hydro-electric Station.—According to *Power*, the first of three generating units is now being installed in what is stated to be only combined natural-gas-fired steam and hydro-electric central station in the world. Owned by the Lamoka Power Corporation, the plant is being erected on Keuka Lake, N.Y., which will supply water for operating the turbines and for the steam boilers. Near the lake, 1,750 ft. beneath the surface of the earth, is a stratum of gas-bearing sand, with a capacity of 3,000,000 cu. ft. of natural gas a day which will furnish fuel for the boilers. In the hydro-electric part of the station, it is planned to install three water-wheel generators—one of 3,000 h.p. capacity, another of 7,500 h.p. and a third of 10,000 h.p. Pumped storage will be made use of, with water being stored during off-peak hours for use when load demands are the greatest. The total cost of the construction and equipment will be approximately $1,000,000.

Warrington.—Year's Working.—The net profit on the electricity undertaking for the past year was £13,559, as against £19,865 in 1929-30. Sales to power users showed a decline of 952,000 kWh, but this was partly offset by an increase in the domestic and lighting sales of 593,000 kWh.

West Hartlepool.—Loan.—The Corporation Electricity Committee proposes to apply to the Electricity Commissioners for sanction to the borrowing of £5,000 for mains and services.

Weymouth and Melcombe Regis.—Year's Working.—The accounts of the Corporation Electricity Department (engineer: Mr. Geo. Nicolson) for the twelve months ended March 31st last show a total revenue of £39,682 and a working expenditure of £22,195, leaving a gross profit of £17,487. The corresponding figures for the preceding year were:—Income, £35,540; working expenses, £20,266; gross profit, £15,274. There was a net profit of £1,185, as against £1,053 in the preceding year. During the year the capital expenditure amounted to £21,909, making a total of £270,869 now spent on the undertaking. Electrical energy sold (including public lighting) increased from 3,032,517 to 3,670,578 kWh, and the maximum supply demanded from 1,754 to 2,150 kW. New consumers numbered 413, bringing the total now connected to 3,816.

Wimbledon.—Year's Working.—In his report for the past year, Mr. A. E. McKenzie, borough electrical engineer and manager, states that the net profit was £33,676, as compared with £20,310 in the previous year. Revenue amounted to £217,837, as compared with £189,306, while generating costs totalled £51,355, as against £45,956. The average price obtained per kWh fell from 1.626d. to 1.552d. Energy sold rose from 25,388,075 to 30,143,349 kWh, this being the largest increase so far recorded. The hiring department continued to expand, and at the end of the year there were 16,581 appliances out on hire. The total mileage of the mains laid at March 31st was 637,933, of which approximately 43 miles were laid last year.

Floodlighting of New Town Hall.—The Corporation Electricity Committee is to arrange for the floodlighting for a week of the new town hall which is to be opened shortly.

York.—Cooking Installation for Hospital.—The Corporation Health Committee recommends the installation of electric cooking equipment at the fever hospital at a cost of £280.

Traction

Colne.—ESTABLISHMENT OF CENTRAL TRANSPORT AUTHORITY.—A proposal to establish a central authority to control the transport undertakings of Colne, Burnley, and Nelson Corporations has been approved in principle by Colne Council, and negotiations will now open with Burnley and Nelson to arrive at a satisfactory arrangement. By co-ordination of the three systems it is anticipated a great saving can be effected in running costs, and that a greater degree of efficiency can be attained.

Hull.—DEPARTMENT'S CHANGE OF NAME.—The Corporation Tramways' Committee has decided that in future the Department shall be known as the "Hull Corporation Transport Department."

Irish Free State.—CORK.—The remaining tramway services in Cork were discontinued last week, the change-over to 'buses having now been completed.

London.—OXFORD STREET TRAFFIC SIGNALS.—In reply to a question in the House of Commons upon the working of the electric traffic control signals in Oxford Street, Mr. Pybus, Minister of Transport, said that he was satisfied that the experimental system of control of traffic in Oxford Street by means of light signals had proved its usefulness in increasing the flow of traffic and relieving congestion. Observations were taken throughout three days as nearly comparable as possible, the first on a date before the Regulations were made, the second after the Regulations had been made but before the light signals were working, and the third ten days after the signals came into operation. The observations, though necessarily limited in their scope, showed a progressive improvement. The average speed on journeys taken by the test vehicles in Oxford Street showed an increase of nearly 50 per cent. between the first day and the last, the saving of time being about four minutes on each journey. During the more congested afternoon hours the increase in average speed was no less than 90 per cent. and the saving of time on each journey nearly eight minutes. He had now asked the London Traffic Advisory Committee to consider and report upon the representations which had been received with regard to the Regulations.

THE LUDGATE CIRCUS TRAFFIC SIGNALS.—The Ludgate Circus traffic signals, which have been out of operation to permit the installation of signals for the direction of pedestrians, were put into service again last Wednesday.

Manchester.—ADVERTISING ON TRAMCARS.—The Corporation Transport Committee has removed its ban on advertising on tramcars and 'buses, and is now inviting a tender for the advertising rights for a period of five years.

RECONSTRUCTION OF TRAMWAY TRACK.—The Corporation is to reconstruct the tramway track in City Road at a cost of £6,475.

Newcastle-upon-Tyne.—TRAMWAY TRACK RENEWAL.—Considerable discussion took place at a recent meeting of the Corporation Transport and Electricity Committee on the question of tramway track renewal. The Committee was unanimous on the point that the tracks were worn out and renewal was necessary if the tramway services were to be continued. Discussion arose on the desirability of continuing the tram services or otherwise. Some of the members of the Committee were of opinion that the substitution of 'buses for trams was inevitable, and therefore the renewal of tracks at a cost of £20,000 a mile was indefensible. It was decided to refer the responsibility of making a decision to a special meeting of the committee to be held in the near future.

Scarborough. — TRAMWAY ABANDONMENT. — Scarborough's trams, which have recently been taken over by the Corporation, ceased to run on September 30th. 'Bus services, controlled by the United Automobile Service, Ltd., have been substituted.

Southern Railway.—AUTOMATIC TRAIN CONTROL.—Successful experiments were carried out last Tuesday on the Southern Railway with the Strowger-Hudd automatic train control system. The system, which is applicable to both steam and electric trains, is designed to prevent accidents caused by the driver accidentally overrunning a signal set against him.

Sunderland.—LOAN SANCTIONED.—The Corporation has received sanction to the borrowing of £9,970 for the purchase of twelve new tramway trucks and equipment.

PURCHASE OF SECOND-HAND TRAMCARS.—The Corporation Tramways Committee recommends the purchase of two second-hand tramcars from the Accrington Corporation.

THE BOW-COLLECTOR TROLLEY.—Sunderland is believed to be the first town in the country to have adopted entirely the bow-collector type of trolley, and the conversion of the tramway system to this type is to be marked by an official ceremony.

Wallasey.—TRAMWAY ABANDONMENT.—The Corporation Tramways Committee has applied for permission to substitute 'buses for trams on the Seacombe-New Brighton route.

Wimbledon.—TRAMWAY ABANDONMENT.—The London United Tramways, Ltd., is to cease running the tramway services along Coombe Lane and Francis Grove to-morrow.

Wakefield.—PROPOSED TRAMWAY ABANDONMENT.—The Yorkshire (West Riding) Electric Tramways Co., Ltd., has applied to the Traffic Commissioners for road service licences covering the existing Wakefield-Leeds electric tramways route. The company, under an agreement with Leeds City Council, has run trams into Leeds for a good many years past, but now proposes to abandon them in favour of motor-'buses.

Telegraph and Telephone

Egypt.—AUTOMATIC TELEPHONY.—The general auto-exchange equipment of Cairo was brought into service at midnight on September 30th. The exchange equipment was manufactured and installed by Standard Telephones & Cables, Ltd., and the instruments fitted on subscribers' premises by the Automatic Telephone Manufacturing Co., Ltd. The total cost amounts to £E.200,000. The total number of subscribers in Cairo exceeds 14,000, apart from 2,000 lines for the Ministries and their administrative departments. In 1927 Cairo had a population of 1,250,000, or about 75 persons to one instrument.

The exchange has an initial capacity of some 16,000 lines, and two smaller exchanges, serving the Ministries and the State Railways, as well as a new trunk exchange, have also been installed and brought into service. The exchange equipment is of the rotary automatic type, and installation was undertaken with Egyptian labour provided by the Egyptian State Telegraphs and Telephones Department. In order to train Egyptians in the handling of this system four engineers and forty-three artisans were sent over from Egypt for a special course of instruction at the works of Standard Telephones & Cables, Ltd., which lasted for ten months. A special feature of the system is the common power drive. Each automatic switch on a rack is mounted close to a continuously rotating shaft. When it is required to move a switch, a clutch magnet is operated which couples the switch to the driving shaft long enough to bring the switch to the desired position.

Hull.—AUTOMATIC TELEPHONY.—The Corporation Telephones Committee's manager has reported that to meet anticipated demands it is essential to extend the existing automatic exchange at Mytongate by 2,000 lines, and the committee has authorised this extension at a cost of £18,000.

The Telephone Service.—STATISTICS.—The total number of telephones in the Post Office service on July 31st, for which date statistics are now issued, was 2,006,040, which represented an increase since the corresponding day of the previous month of 1,992 telephones, of which 1,481 were in the provinces, and 511 in London. Call-office stations increased by 267, while eleven more rural railway stations were connected with the exchange system. Trunk calls made in May (the latest month for which statistics are available) numbered 10,322,247, a decrease of 228,482 calls on the total for the corresponding month of 1930. Outgoing international calls in May numbered 45,190, and incoming international calls 49,322, as compared with 48,354 and 51,027, respectively, in May, 1930.

NORTHERN IRELAND.—The number of exchanges now in operation is 171, while there are 25,000 telephones in use, this being an increase of some 1,500 over last year. New exchanges have been established at Altamachin, Belleck, Cushenden, Dromore, Garrison, Garronpoint, Groomsport, Tullyhommon, etc.

Radio

B.B.C. Activities.—The engineering Branch of the Corporation moved into Broadcasting House, the new London headquarters, on September 26th, but it is unlikely that any of the new studios will be used for at least another two months. The following announcements are also made officially in *World-Radio*.

NEW SCOTTISH STATION.—The construction of the regional station at Westerglen, near Falkirk, is proceeding satisfactorily; in two or three weeks the roof will be completed, and the installation of the equipment will commence. It is hoped that one of the two transmitters will be ready to test transmission by the early summer of next year. The present intention is to use the 376.4 metre wavelength (797 kc/s) for the regional transmitter, and 288.5 metres (1,040 kc/s) for the national transmitter.

ULTRA-SHORT WAVES.—With reference to the B.B.C.'s proposed short-wave experiments, it is believed that waves shorter than about 9 metres are not reflected by the Heaviside layer, and, therefore, the absence of the indirect ray obviates interference in areas outside those which it is intended to serve. However, attenuation of the direct ray is very great indeed, and it is unlikely that it would penetrate to a greater distance than about seven miles; even if a range as short as this is obtainable in practice, a centrally situated transmitter in a densely populated area might quite easily be capable of providing a valuable supplement to the main system of distribution on medium and long wavelengths, and a number of these stations might be built without creating mutual interference between this country and the Continent. Whether or not the existing information concerning the behaviour of wavelengths as short as this can be confirmed is the object of the experiments which it is proposed to undertake. There is no likelihood at present of receivers designed for the present broadcast wave-band becoming obsolete.

South Africa.—PROPOSED PRIVATE STATION.—An American firm is about to erect a broadcasting station at Cape Town, with the object of broadcasting chiefly advertising matter. Application was made last year for permission to erect such a station, and it was granted subject to the usual provision of non-interference being complied with. It will operate when the Cape Town station of the African Broadcasting Company is not "on the air." Transmission will be on a wavelength of 343 metres, and it will have an effective range of about fifty miles.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—VICTORIAN ELECTRICITY COMMISSION.—November 16th. Aluminium steel cored cable. (September 4th.)

MELBOURNE.—December 1st. Post and Telegraph Department. Condensers. (A.X. 11111.)*

January 4th. Paper and varnished cambric insulated, lead covered, steel wire armoured cable. (A.X. 11127.)*

Edinburgh.—October 16th. Corporation. Installation of electric lighting and power in 242 houses and four shops in Niddrie Mains housing area. Specifications, &c., from the Engineer's Office, Dewar Place (deposit £1 1s.).

Egypt.—CAIRO.—October 28th. Department of Public Health. Electro-medical and X-ray apparatus for six months commencing November next. (A.X. 11069.)*

December 2nd. Ministry of the Interior. Complete power station for the town of Tantah. (A.X. 11066.)*

Fort William.—October 17th. Town Council. Various works, including electrical, in connection with the erection of 66 houses. Specifications from Mr. Andrew Forrester, borough surveyor.

Glasgow.—October 14th. Corporation. Electrical installation work for three housing schemes. Specifications, &c., from the general manager, Electricity Department, 4, West Regent Street, Glasgow.

Halifax.—October 14th. Town Council. Wiring of twelve bungalows, Nursery Lane, Rugby Mount site. Particulars (deposit £1 1s.) from Mr. A. C. Tipple, borough engineer, Crossley Street.

Horsham.—October 27th. Electricity Department. Rotary convertor equipment or alternatively mercury arc rectifier equipment. (See this issue.)

India.—NEW DELHI.—January 7th. Indian Stores Department. A.c. and d.c. ceiling fans. (A.X. 11116.)*

Lanarkshire.—County Council. Various works, including electric lighting, for housing scheme. Particulars from Mr. P. C. Smith, county housing and town planning engineer, Hamilton.

London.—SOUTHWARK.—October 21st. Borough Council. Cable. (September 11th.)

Manchester.—October 12th. Waterworks Committee. Four electrically-driven centrifugal pumps, with switchgear, pipes, valves, &c., at Lostock booster station. Specifications (deposit £2 2s.) from the waterworks engineer, Waterworks Offices, Town Hall.

October 13th. Public Health Committee. Cable for Withington Hospital, Nell Lane, West Didsbury. Specification from the superintendent of works, Public Health Department, Public Assistance Offices, All Saints, Manchester.

October 13th. Baths and Washhouses Committee. Electric lighting installation at New Moston Baths. Specification (deposit £1 1s.) from city architect, Town Hall.

October 24th. Electricity Committee. Automatic voltage variation equipment and switchgear. (See this issue.)

New Zealand.—WELLINGTON.—November 19th. New Zealand Railways. Intercall telephone system between Christchurch and Invercargill. (A. 11060.)*

December 18th. Armoured cables and junction boxes. (A.X. 11122.)*

January 18th. Railway overhead equipment. (G.X. 10792.)*

February 29th. Three automatic railway sub-stations. (A.X. 11105.)*

November 10th. Post and Telegraph Department. 5,650 condensers. (A.X. 11101.)* and 2,300 lamp caps. (A.X. 11102.)*

November 11th. Twelve time delay relays. (A.X. 11103.)*

November 17th. Resistance spools. (A.X. 11104.)* Twenty 700-ohm resistance spools. (A.X. 11114.)*

November 21st. Dial cords. (A. 11121.)*

November 24th. 500 telephone mouthpieces. (A.X. 11115.)*

November 26th. Connection strips. (A. 11120.)*

November 30th. Moulded telephone cases. (A. 11119.)*

December 15th. Public Works Department. 50-kV oil-immersed circuit breakers for Arapuni. (A.X. 11118.)*

INVERCARGILL.—October 28th. City Council. Centrifugal low-lift pumping plant, including motor and control gear. (G.X. 10738.)*

CHRISTCHURCH.—November 12th. City Council. Pump, motor and control gear for Mays Road pumping sub-station. (G.X. 10774.)*

Northern Ireland.—November 16th. Electricity Board. 3½ miles of 132-kV and 33-kV four circuit overhead transmission line. (See this issue.)

South Africa.—JOHANNESBURG.—October 22nd. City Council. Twenty 50 h.p. tramcar motors. (A.X. 11107.)*

October 21st. Portable d.c. arc welding motor generator set. (A.X. 11125.)*

BENONI.—November 9th. Municipal Council. Electrically operated automatic traffic control signals.

South Shields.—October 13th. Housing and Town Planning Committee. Wiring of 236 flats, Tyne Dock. Specification and form of tender from Mr. J. Paton Watson, borough engineer, Town Hall, South Shields.

Switzerland.—November 21st. Die Etzelwerk Gesellschaft, Pfaffikon, Canton Schwyz. Six two-stage vertical-shaft turbines for the new Etzelwerk hydro-electric power station. The turbines are to be capable of developing a maximum of 22,000 h.p. and have a normal output of 20,000 h.p. at 500 r.p.m. when working under a head of 1,561 ft. Particulars for 20 Swiss francs.

West Riding.—October 12th. Mental Hospitals Board. Lamps. (October 2nd.)

October 15th. Wiring for electric lighting in various buildings at the Wadsley Mental Hospital, near Sheffield. Particulars from Mr. W. E. H. Burton, architect and engineer, West Riding Mental Hospital Board's Offices, Wakefield (deposit £1).

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barking.—Electricity Committee. Recommended:—
L.p. cables (£639).—Electric Cable & Construction Co., Ltd.

Eastleigh and Bishopstoke.—Urban District Council. Accepted:—
Plant for the sewage scheme, including a complete power house plant.—Blackstone & Co., Ltd.

Glasgow.—Corporation. Accepted:—
Electric lighting of Stirling and Kinning Park Libraries (£504).—Reid & Carrick.

Electricity Committee. Accepted:—
Plant and appliances required in connection with the change of frequency.—Eight new motors, two motors rewound, reconditioned oil burning plant, spare bearings and brushes, pulleys, couplings and no-volt coils, erection of plant (£1,039).—Harland Engineering Co., Ltd.

Municipal Transport Committee. Accepted:—
Switchgear for Pinkston station.—General Electric Co., Ltd.

Halifax.—Town Council. Accepted:—
Installation of electric lighting at twelve bungalows.—J. Pilling & Co.

Hetton-le-Hole.—Durham County E.C. Accepted:—
Installation of electric lighting in council school.—T. A. Taylor.

Hull.—Telephones Committee. Accepted:—
Bronze wire.—F. Smith & Co.
Automatic switchboard (£248).—Automatic Telephone Co., Ltd.

Mental Hospital Committee. Accepted:—
Electric goods lift at mental hospital (£249).—Pickerings, Ltd.

Salford.—Electricity Committee. Recommended:—
L.p. switchboard equipment for Trafford sub-station (£209).—English Electric Co., Ltd.
New chain for ash conveyor (£440).—Robert Dempster and Sons, Ltd.
Transformers (£1,500).—General Electric Co., Ltd.

Seaham Harbour.—Housing Committee. Recommended:—
Fourteen electric wash boilers for housing estate.—Burnley Components, Ltd.

Tynemouth.—Watch Committee. Accepted:—
Automatic traffic signals (£354).—Revo Electric Co., Ltd.

Electricity Committee. Accepted:—
Voltage regulator (£221).—English Electric Co., Ltd.

York.—Public Assistance Committee. Accepted:—
Electric hydro-extractor (£287).—Watson, Laidlaw & Co.

Forthcoming Events

Association of Mining Electrical Engineers (West of Scotland Branch).—Wednesday, October 14th. Royal Technical College, Glasgow. Presidential address. Mr. A. Dixon.

Institution of Engineering Inspection.—Wednesday, October 14th. Royal Society of Arts, London. 5.30 p.m. "Some Applications of Condensers to Electric Power Circuits." Mr. P. R. Coursey.

Birmingham Electric Club.—Friday, October 16th. Grand Hotel, Birmingham. 7 p.m. Ladies' night.

British Electrical Development Association.—Friday, October 16th. Royal Society of Arts, London. 7.30 p.m. "Light Therapy with particular reference to Ultra-violet Irradiation." Dr. W. Beaumont.

Overhead Lines Association.—Friday, October 16th. Georgian Restaurant, Harrods Stores, W. 8 p.m. Third annual conversazione.

Association of Supervising Electrical Engineers.—Saturday, October 17th. Lysbeth Hall, Soho Square, W. Dinner, whist drive, and dance.

Institution of Engineers-in-Charge.—Wednesday, October 14th. St. Bride's Institute, E.C. 7.30 p.m. "Further Engineering Notes on a World Tour." Mr. W. Reavell.

Institution of Electrical Engineers (Western Centre).—Monday, October 12th. South Wales Institute of Engineers, Cardiff, 6 p.m. Chairman's address. Mr. J. Wayne-Morgan.

Electrical Power Engineers' Association (Manchester Section).—Saturday, October 10th. Grand Hotel, Manchester. 5.30 for 6 p.m. Dinner and dance.

Institute of Transport.—Monday, October 12th. Institution of Electrical Engineers, London. 5.30 p.m. Presidential address. Mr. F. Pick.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

GRANLY lantern.
BETAX violet-ray apparatus.
ACETATE electric signs.
Electric alarm mats.

Notes

Extensions at Stockport

Thursday last week saw the official inauguration, by Councillor Joseph Morton, chairman of the Electricity Committee, of the recent extensions at the Stockport electricity works, which include a 20,000-kW Escher Wyss-Brown Boveri turbo-alternator set, bringing the plant capacity of the station up to 55,000 kW, and four Babcock & Wilcox boilers, increasing the total steaming capacity of the boiler house to 490,000 lb. per hour. Prior to the actual starting up of the new set the guests were welcomed by the Mayor of Stockport, Councillor James Penny, while the opening of an exhibition of electrical appliances, etc., at the works, by Mrs. Penny, was an interesting feature of the proceedings. After the ceremony the ladies were entertained to tea at the exhibition, and the gentlemen at the Town Hall. The ladies' programme included addresses by representatives of the Manchester and Salford District Branch of the Electrical Association for Women—Mrs. H. C. Lamb, wife of the city electrical engineer, Manchester, Mrs. Carr, and Miss Forbes. A few minutes' talk was also given by a representative of each exhibitor on various points relating to the class of apparatus concerned. The exhibition, which will remain open till October 10th, is divided into two sections, general (largely lighting fittings), and heating and cooking. Among the exhibitors are the General Electric Co., Ltd., Ferranti, Ltd., Jackson Electric Stove Co., Ltd., Electric Fires, Ltd., Credenda Conduits Co., Ltd., W. E. Beardsall & Co., Siemens Electric Lamps and Supplies, Ltd., and Edison Swan Electric Co., Ltd.

The proceedings at the Town Hall opened with a pleasing "unofficial" item when Mr. Bayliss, of Babcock & Wilcox, Ltd., on behalf of the contractors, presented Councillor J. Morton with an electric clock. Alderman J. Hewitt, chairman of the St. Helen's Electricity Committee, proposed "The Electrical Undertaking," to which Councillor Morton replied, and Councillor D. Scott-Morton, member of the Stockport Committee, proposed "Our Visitors," which was replied to by Alderman W. Walker, M.I.E.E., chairman Manchester Electricity Committee, and a member of the Central Electricity Board. A high tribute to the work done by Mr. R. Lee, A.M.I.E.E., borough electrical engineer, Stockport, and his staff, was paid by Alderman G. Ball, vice-chairman, Stockport, and Mr. Lee suitably replied.

The Electrical Power Engineers' Association

One hundred members of the Manchester Section of the Electrical Power Engineers' Association took part in a visit to the Kearsley Power Station of the Lancashire Electric Power Company, on Saturday, September 26th, 1931, by permission of Mr. M. H. Adams, generation engineer of the company. After a tour of the station, tea was provided by the power company, and Mr. S. A. Russell (power stations engineer, Manchester Corporation) voiced the thanks of the visitors to Mr. Adams and his staff. Mr. Adams, in a brief reply, apologised for the absence of Mr. C. D. Taite (director and general manager) due to a previous engagement.

Manchester's First Air Beacon

The first air beacon of its kind in this country is to be erected on the new building of Messrs. Rylands & Sons in Market Street, Manchester. Messrs. Rylands & Sons, in collaboration with the Air Ministry, and the Airport Committee of the City, have arranged for the erection of a steel mast. The beacon will project in all directions from sunset to sunrise, being visible under normal atmospheric conditions for some sixty miles, and will be charted by the Air Ministry as the official aviation beacon for the air port of Manchester. The height above sea level will be 315 ft. It will be fitted with 25 neon tubes each 12 ft. in length, and 36 tubes 3 ft. 6 in. in length, arranged in conical formation around the hexagonal mast. Provision is being made for a flat steel platform on the top, upon which will be mounted at a later date a powerful searchlight, the rays of which will be projected towards the airport at Barton, as an additional directional guide.

Faraday House Old Students' Association

The 23rd annual dinner of the Faraday House Old Students' Association will be held on October 23rd at the Savoy Hotel. Mr. G. R. J. Parkinson, M.I.E.E., of the Midland Electric Corporation for Power Distribution, president of the Association, will be in the chair. Members of the Association are reminded that they may introduce guests, who need not necessarily be Faradians. There will be an opportunity for informal conversation after the dinner. Applications for tickets, price 10s. 6d. each, should be made to the hon. secretary, 66, Southampton Row, W.C.1.

The Progress of the Grid

In the House of Commons on September 30th Sir Douglas Newton asked the Minister of Transport if he would state how many route miles of the primary transmission system of 132,000-V lines had been erected by the Central Electricity Board; how many were in operation; and what was the grand total for all the schemes.

Mr. Pybus said he was informed that approximately 1,070 route miles of the 132,000-V lines had been erected, and that approximately 380 route miles were in operation. For all the schemes adopted to date approximately 2,925 route miles of 132,000-V lines were proposed.

New Diesel-electric Ships

An ice-breaker to be named *Ymer*, recently ordered by the Swedish Government from the Kockums Mekaniska Verkstads, is to displace 4,300 tons and be Diesel-electrically propelled. Six 1,500-b.h.p., 325-r.p.m. engines will each drive direct a 1,050-kW, 440-volt d.c. generator, feeding three 2,700-b.h.p., 140-r.p.m. motors, each coupled to a separate propeller, two aft and one forward. The auxiliary plant will consist of two 150-kW Diesel-electric generators.

According to the *Motor Ship*, the Italian Navy recently commissioned a training ship of 3,700 tons, which has a sail area of 1,900 sq. m. and two 1,250-b.h.p., 350-r.p.m. Diesel engines, each driving a 740-kW, 230-volt d.c. generator, with a 120-kW, 110-volt exciter on a shaft extension. The whole of the electrical gear was supplied by Ercole Marelli and C.S.A., Milan.

A single propelling motor is installed, developing 2,000 b.h.p. at 120 r.p.m. continuously with one generating set in service. The current is supplied in series by two pairs of dynamos working in parallel, and at the full output the propelling motor operates at approximately 450 volts.

Interlocked control of the machinery can be effected either in the engine-room or in the pilot-house, but not simultaneously, luminous signals indicating which machines are in operation and their speeds. Auxiliary power is furnished by four 150-b.h.p. 500-r.p.m. engines, coupled direct to 100-kW, 110-volt d.c. generators. The *Amerigo Vespucci* is somewhat larger than the *Cristoforo Colombo*, a similar vessel, which, however, has steam turbine-driven generating plant; propulsion is by two electric motors of 800 b.h.p. instead of one of 2,000 b.h.p.

The deck machinery is all electrically operated, including a certain number of winches and the anchor windlass and capstans. The engine-room pumps are electrically driven.

B.S.S. for Street Lighting

The British Engineering Standards Association has just issued a revision of the British Standard Specification No. 307, for Street Lighting.

Five new definitions, covering highway, carriageway, footway, margin, and kerb, have been included, but the chief points in the revision are in the specification itself. Footway illumination has been included and a column has been added to Table II, giving the lowest recommended height of the luminous centre of the light source above the ground. The definition of the mounting heights in the 1927 specification as minima had the result of the minimum being adopted as the maximum or adequate height. In the case of streets lighted on one side only, the height of the posts must not be less than two-thirds of the width of the roadway. In the 1927 edition, a general spacing-height ratio of not more than 12 was specified, but in the revision a maximum has been given, varying according to the different classes of installation, and in addition a *recommended* maximum has been included to encourage the diminution of the spacing-height ratio wherever possible.

A requirement has been inserted that with any tender there shall be given in the values of the maximum and average illumination on the roadway, the average illumination to be calculated by a method to be agreed by the purchaser. No numerical expression of glare has been included in the revision, but guidance is offered as to the means by which glare may be mitigated.

The classes given in Clause 14 are only used for reference purposes and do not necessarily represent the relative merits of the installation. Each class, from "A" to "G," is expected to have its application to some category of roadway, the decision as to which one is best suited to the purpose being left to the lighting authority.

Copies of the revised Specification (B.S.S. No. 307-1931) may be obtained from the Publications Department, British Engineering Standards Association, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Sub-station Showrooms

On Saturday, September 26th, a new automatic sub-station known as Murray's Acre was opened by Provost Anderson at Faraday Avenue, Wishaw, which has been so named as a tribute to Michael Faraday. The sub-station, which is the first of a series of four which will be put into operation in the near future is of Reyrolle-Mather & Platt construction and is entirely automatic. An interesting feature of its design is the introduction of two show-case windows in the frontage in which it is intended to display a selection of electrical appliances which can be obtained from the burgh showroom at headquarters; great local interest has been shown in the innovation. The capacity of the plant is 300 kW in this sub-station; the others in course of construction will be 1,000 kW, 500 kW, and 250 kW respectively.

After the opening ceremony, Provost Anderson was presented with a crystal and silver table lamp by Mr. Martin, of Messrs. Reyrolle & Co., representing the contractors.

Afterwards the Provost entertained the company to tea, and speeches were made by Provost Anderson, Ex-Bailie Crichton (convener, Electricity Committee), Messrs. E. Seddon, M.I.E..E (Edinburgh Corporation), A. Burgess (Messrs. Reyrolle & Co.), and W. D. Brassington (burgh electrical engineer, Motherwell and Wishaw).

Educational

UNIVERSITY COLLEGE, London.—The 1931-32 calendar is now available and contains full particulars of the courses, scholarships, etc., for the new session.

The BOROUGH POLYTECHNIC, Borough Road, S.E.1.—The prospectus for 1931-32 is now available and gives full details of the day and evening classes just recommencing in all branches of electrical and radio engineering, telephony and telegraphy, heating and ventilation, refrigeration, &c.

Oil-blast Circuit Breakers

The interruption of a circuit in a plain-break circuit breaker depends upon the drawing of an arc which, due to inherent magnetic blowout or accidental turbulence of the oil, will ultimately be broken up at the current zero by partitions of solid oil thick enough to withstand puncture by the recovery voltage across the circuit breaker terminals. This procedure can be replaced by a positive and definite oil-blast action by enclosing the two breaks in such a way that pressure from the gas bubble at one break will propel a blast of solid oil across the second break. Tests reported in the *Electrical World* show that 3,000- to 15,000-V switches with an interrupting capacity of 175,000 kVA the maximum arc duration is reduced from 7.75 to 1.75 cycles and the arc length from 3.5 to 1.5 in.

The Exhibition of Inventions

Many exhibits of electrical interest are to be seen at the annual International Exhibition of Inventions and General Trades now being held at the Central Hall, Westminster, S.W.1. The exhibition is organised by the Institute of Patentees and prizes are awarded for the most useful inventions on show; only inventions not in a state of production are eligible for this competition. In the electrical and wireless section the most popular subjects are terminals, switches, junction boxes, and combined switch and lighting units. Anti-dazzle devices for automobiles are also prominent, while other exhibits of note include an improved accumulator top, tubular heaters, torches, surgical examination lamps, electrical advertising devices, apparatus for teaching the morse code and various improvements in radio receiving apparatus. Among those exhibiting in the trade section are Messrs. Leland, Patton & Co. (electric fires and motor inspection lamps), J. A. Brook (electric lamp locks), and the Skiwall Co. (detachable pulley fitting for outdoor aerials). The exhibition closes to-morrow.

Comparative Tests on British and Foreign Illumination Glassware

It has often been said that Great Britain cannot supply illuminating glassware as good as that made by foreigners, and to disprove that statement, Hailwood and Ackroyd, Ltd., selected one of the best known illuminating shades put on the market by one of the largest electrical suppliers in Great Britain, and made up moulds to the pattern and blew up glassware out of their solid opal and three-ply glass. The productions were submitted to the National Physical Laboratory, and identical tests have been carried out on all three, so as to get a fair comparison between the two glasses and foreign glass. From the following summary of the report it will be seen that in the solid opal the British make is only three per cent. below the foreign glass, which difference in a room, shop or office, would be imperceptible, but that in the British three-ply glass the results are ten per cent. superior to the foreign glass.

Make.	Type of Glass.	Maximum Candle Power at Given Points. Left Side 50°.	Bottom Centre Zero 0°.	Right Side 50°.
British	Solid Opal	95	120	95
British	3-ply Opal	97	135	103
Foreign	Solid Opal	95	121	98

Institute of Fuel

The annual dinner and dance of the Institute of Fuel will be held on October 21st at the Connaught Rooms, Great Queen Street, W.C.

The O.L.A. Conversazione

The Overhead Lines Association is to hold its annual conversazione on October 16th at the Georgian Restaurant, Harrod's Stores, Knightsbridge, at 8 p.m. There will, as usual, be exhibits of work with which members are associated, also dancing, and supper. This Association was founded in 1927, one of its main objects being to assist in making available a supply of electricity in every home, particularly in rural areas, where overhead distribution is essential. It does not regard its annual conversazione as in any way an exclusive function, but hopes rather to welcome as many guests as possible who are interested in the development of electrical distribution on the countryside. A most cordial invitation is particularly extended to ladies. Tickets (price 12s. 6d. each) can be obtained from the hon. secretary, Mr. G. W. Molle, 44, Devonshire Chambers, 146, Bishopsgate, E.C.2.

Illuminating Engineering Society

The opening meeting of the 1931-2 session of the Illuminating Engineering Society is to be held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London, W.C.2, on October 20th at 6.30 p.m., when the report on progress will be presented, and there will be a series of exhibits illustrating progress in illuminating engineering. Any members desirous of showing novel instruments, apparatus or lighting equipment are requested to inform the honorary secretary (Mr. J. S. Dow, 32, Victoria Street, London, S.W.1) as soon as possible.

At the subsequent meeting of the Society to be held at the Royal Society of Arts, John Street, Adelphi, London, W.C.2, at 6.30 p.m. on October 30th, a discussion on floodlighting in connection with the International Illumination Congress will be opened by Mr. Percy Good.

Transmission-line Analysis

An analysis of the engineering details of 887 transmission lines in the U.S.A. is described in the *Electrical World*. It was found that the effective load on a line is represented by the term "Megavolt-ampere-miles," which combines the magnitude of the electrical load with the distance over which it is transmitted. The old rule-of-thumb method of relating line voltage to length (e.g. 1,000 V per mile) is useless to-day as high voltages are used not only for long lines but also for relatively short lines carrying heavy loads. The indications are that in the near future a minimum voltage may be found for all lines regardless of length or electrical load. Another relationship discussed is that between the span of a line, the current carried, and the size of conductor. It is noted that the wind and ice loading to which the conductor is subject is an important factor in determining conductor size or permissible span length.

British Glass Research

Sir Richard Gregory will open at 4 p.m. on October 21st, at the Science Museum, South Kensington, an exhibition which will illustrate modern research in the British glass industry. It is being arranged by the Society of Glass Technology, with the support of the Glass Research Delegacy. The Society was the first of its kind in the world. In addition to the exhibition (which will be in a small gallery at the right-hand side of the entrance in Exhibition Road) there will be lectures on Thursday afternoons by well-known authorities, who will deal with modern developments in optical glass, plate glass, electric lamp bulbs, safety glass, and artistic glassware. The public will also have an opportunity of seeing glassmaking kinema films every day at 4.15 p.m. until the exhibition closes on December 31st, 1931.

Transformer Protection

We learn from Dr. Buchholz that the estimate of the capacity of transformers protected on his system given in an article published in the ELECTRICAL REVIEW, of May 1st, entitled "Transformer Protection," was too low. It appears that at the present time some 10,000 transformers, having an aggregate capacity of about 33 million kVA, are so protected.

The Mercury-jet Rectifier

At the recent meeting of the British Association for the Advancement of Science, Professor Julius Hartmann read a paper on "Spark-neglecting Commutation; a New Principle in Large Power D.C. Production." The principle is outlined and the size of the load and voltage which can be dealt with by a simple jet-wave commutator operated in hydrogen are reported. The paper discusses the main results and types, jet-chain, spiral-wave, and plate-jet commutators being described; they differ only in the way in which the moving member of the commutator is produced. The final part of the paper discusses the future transmission electrical energy in the form of high-voltage direct current. It is pointed out that a step-up and step-down d.c. transformer can be built as a combination of an inverter and a rectifier. The author expresses the view that the principle will lend itself better than perhaps any other, and a special plant has been built for the study of the problem from this point of view.

PROF. MILES WALKER, in opening the discussion, said that the system of commutation described had the attractive characteristic that it could be used for the conversion of direct to alternating currents. There were so many advantages in long-distance power transmission by d.c. that the problems connected with such a scheme must be solved eventually. The "Transverter" system was certainly not a failure, but the proposal had failed to convince practising engineers. The future would show that direct-current transmission would be used over long distances, with local conversion to alternating current by rotary machines and the installation of mercury-vapour rectifiers as the means of spark prevention.

PROF. W. CRAMP said that when the grid system of distribution was first proposed, he suggested that it might not be many years before d.c. would supersede a.c. transmission. With the mercury arc rectifier, successful work was possible in practice up to 10,000 volts, and in the laboratory to 100,000 volts. Such results did not seem possible with mercury-jet apparatus.

PROF. J. HARTMANN, in reply, said that spark arresting by the mercury jet-wave commutator could be effected economically, but not with very small plant. He thought there was no limit to the magnitude of the voltage that could be dealt with by "spark-neglecting" commutation, by combinations of sets of equipment. The idea of the dissociation of hydrogen being the solution of what happened within such an atmosphere was not new. The same effect was found in electric arc welding in a hydrogen atmosphere. He had conducted experiments on the commutator with hydrogen pressures up to twenty atmospheres. There was no necessity for any cooling system with the plant.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. B. B. Blackburn has been appointed as resident director in charge of the London business of Messrs. Best & Lloyd. Mr. Blackburn has been a director of the firm for some years, and deputised for the late Mr. R. H. Best during the closing years of his life as president of the Brassfounders' Employers' Association. Subsequently he held that office himself for some years, and is now a vice-president.

Mr. George A. Phillipson, who has been technical representative for the Coppée Company (Gt. Britain), Ltd., has joined the Steel Band Conveyor & Engineering Co., Ltd., of Birmingham, to represent them in London and the South. He will continue to reside in London.

The honorary degree of D.Sc. was conferred upon **General J. C. Smuts, Lord Rutherford,** and **Sir J. J. Thomson,** at the reception held at Cambridge University, on September 28th, to celebrate the centenary meeting of the British Association.

Mr. W. F. Darke, has found it necessary to relinquish the office of hon. secretary to the Chemical Engineering Group, owing to taking up a new appointment. He is succeeded by **Mr. Donald McDonald,** who has been a member of the Group since its formation. Since 1910, he has been associated with Johnson, Matthey & Co., Ltd.

Mr. A. Ohlson, managing director for South Africa of Metropolitan-Vickers Electrical Co., Ltd., has returned there after a European visit. He was accompanied by Mrs. Ohlson.

Mr. H. R. Ruff, engineer in the Research Department of the British Thomson-Houston Co., Ltd., Rugby, who was recently married, at Sutton, Surrey, to Miss A. R. Branston, was presented by his colleagues with a collection of Tudor plate cutlery.

Mr. W. G. Hamilton has been appointed general manager of the Llandudno and Colwyn Bay Electric Railway Co.

Mr. Cecil Wheatley, manager of the County Electrical Services, Ltd., of Hanley, was married recently to Miss Millicent Mary Coates, of Shelton.

Mr. S. Upton, assistant superintending engineer, North-Western District, Post Office Engineering Department, was recently presented with a mahogany bureau-bookcase and a silver tea-service by his colleagues, on his retirement after forty-four years' service with the Post Office.

Mr. W. Redman, who recently retired from the position of electrical engineer and manager of Shipley Urban District Council's electricity undertaking after thirty-one years' service, has been presented by the Council with an address of appreciation inscribed on vellum.

Mr. H. W. Bosworth, joint managing director of the Lancashire Dynamo & Motor Co., Ltd., and the Crypto Electrical Co., Ltd. has left for a business tour of South Africa and the Rhodesias.

Mr. A. E. Jackson, M.I.E.E.
Photograph by Elliott & Fry, Ltd.

We published an announcement by Messrs. Kincaid, Waller, Manville & Dawson in our last issue, that their partnership is being dissolved, and that **Mr. A. E. Jackson,** M.I.E.E., Member of the Association of Consulting Engineers, etc., one of the present partners, will continue in practice under the same title. Mr. Jackson, who has been associated with the company as partner for the last eleven years, has been largely responsible for carrying out various engineering works, both at home and abroad, including power stations, electric tramways, rolling stock, harbour and railway schemes, etc. He specialises in the design of power stations and distribution systems, and amongst other works of this description has been specially responsible for the construction, inspecting, testing and general supervision of the generating and other plant ordered in this country for the Melbourne and Adelaide Electric Supply Companies, for which his company have acted as London consultants for many years past, representing a capital cost of some £1,500,000. Mr. Jackson has also made a special study of railway electrification, and he materially assisted Sir Philip Dawson, both in the original work of electrifying the suburban lines of the London, Brighton and South Coast Railway, and also later in the preparation of the electrification reports which Sir Philip Dawson presented to the Great Western, London & North Eastern, and Caledonian Railway Companies. Mr. Jackson reported on the Avonmouth experimental scheme of the Hydro-Thermal Syndicate, Ltd., and also prepared the original scheme for the Jerusalem public electricity supply.

Mr. W. M. Crowe, who is retiring from the Chairmanship of Ericsson Telephones, Ltd. *(Photograph by Wykeham, London.)*

Mr. W. M. Crowe, the chairman and managing director of Ericsson Telephones, Ltd., is retiring as from October 1st, although he will still retain a seat on the board of directors. Mr. Crowe has been with the British Ericsson Co. from its inception thirty-three years ago, and for twenty-one years has been chairman and managing director. He commenced his London career as manager for Mr. Edison when the phonograph was first brought to this country in 1892. Six years later he was appointed manager in London for Messrs. Ericsson, of Stockholm, whose business in this country at that time was chiefly with the National Telephone Co. In 1903 a private company was formed to take over the factory at Beeston, Notts, owned by the National Telephone Co.—the latter retaining one-half interest, and eight years later, when the Post Office took over the National Telephone Co., a public company was formed by Ericssons to take over the complete factory.

Mr. G. Scott Ram, the president-elect of the Association of Supervising Electrical Engineers, commenced his electrical career with the Hammond Electric Light & Power Co., being one of the first students at the Hammond Electrical Engineer-College, the forerunner of Faraday House, in 1882. After serving with other electrical companies and with various Corporation electricity supply undertakings, he was appointed, in 1902, as the first Electrical Inspector of Factories. On him devolved the duty of drafting a code of regulations dealing with the generation and use of electricity on premises under the Factory Act, which resulted in an agreed code of regulations. During his first six years with the Home Office, there being then no Electrical Inspector of Mines, Mr. Ram was called upon to act in that capacity. He also drafted, in consultation with representatives of the industry, the electrical clauses of the Home Office Regulations under the Cinematograph Act. He became an associate member of the I.E.E. in 1887, and a member in 1897, and has served on the Council and various committees. He has also served on committees of the B.E.S.A. and other bodies. He retired from the Home Office at the end of last year.

Mr. W. G. Thompson has been awarded the Ferranti Scholarship by the Institution of Electrical Engineers.

Mr. Karl Gundelfinger, of Durban, has been reappointed a member of the South African Electricity Supply Commission for a further period of three years.

Mr. W. Hamilton Attwool informs us that he has relinquished his position as branch manager for the Revo Electric Co., Ltd., Glasgow. His temporary London address is "Penryn," Casslee Road, Catford, S.E.

Mr. V. Chaplin, assistant engineer to the Colwyn Bay electricity undertaking, has been appointed engineer and manager of the undertaking.

Mr. C. J. Hyde Trutch, head of the Diesel-electric Traction Department of Sir W. G. Armstrong Whitworth & Co., Ltd., has been awarded the railway (engineering) gold medal by the Council of the Institute of Transport, for his paper on "The Oil Engine and the Railways."

Mr. E. Harper is retiring from the position of chief engineer to the Telegraph Department of Ceylon after ten years' service. Mr. Harper has carried out several improvement schemes which have brought the telegraph and telephone service in Ceylon up to the best modern practice.

The Melbourne correspondent of *The Times* reports that **Sir John Monash** is dangerously ill.

Obituary

Mr. Bernard Drake.—We deeply regret to record the death of Mr. Bernard Mervyn Drake, which occurred on Monday night suddenly as the result of a heart attack, at Saplinbrae, Mintlaw, Aberdeenshire, his Scottish estate. Mr. Drake was chairman of Drake & Gorham, Ltd., of the Tudor Accumulator Co., the D.P. Battery Co., and the National Accumulator Co., Ltd. He was in his seventy-third year. The burial took place yesterday on the estate.

Will.—Sir Hugh Bell, late chairman of Pearson & Dorman Long, Ltd., left £68,038.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Paramount Electric and Equipment Co., Ltd.—Private company. Registered October 1st. Capital £500 in £1 shares. Objects: To carry on the business of dealers in all kinds of electric-lamps, appliances, equipment and accessories, theatre and cinematograph furnishings and equipment, etc. The directors are:—B. Sacov (chairman), 46, Forburg Road, Stoke Newington, N.16; and W. Kublin, 191, Oxford Street, E.1. Registered office: 89, Great Eastern Street, E.

Basingstoke Wire Broadcasting Service, Ltd.—Private company. Registered October 2nd. Capital £4,000 in £1 shares. Objects: To acquire the business of broadcasting by wire and dealing in wireless apparatus and accessories, carried on by A. H. S. MacCallum at Basingstoke as the British Wire Broadcasting Service (Basingstoke). The subscribers are: A. H. S. MacCallum and A. W. L. MacCallum, both of Netherton, Oxford Road, Tilehurst. A. H. S. MacCallum is managing and permanent director. Solicitor: W. How Davey, 266, Earl's Court Road, S.W.5.

Eros Electric Lamp Co., Ltd.—Public company. Registered October 1st. Capital £1,200 in 800 8 per cent. participating cumulative preference shares of £1 each and 4,000 ordinary of 2s. Objects: To carry on business as manufacturers and repairers of and dealers in electric and other lamps, electrical plant, etc. The first directors are:—O. W. Songest, "Clovelly," Cassilis Road, Twickenham; C. F. Hendrick, 127, King's Avenue, S.W.; and H. A. Jager, 49, Airedale Avenue, W.4. Secretary: J. H. Horwood. Registered office: 30, Coleman Street, E.C.2.

Returns of Electrical Companies

Artic Fuse & Electrical Manufacturing Co., Ltd.—Capital £5,000 in 4,700 ordinary and 100 deferred ordinary shares of £1 and 4,000 founders' shares of 1s. each. Return dated December 31st, 1930 (filed April 24th, 1931). 2,433 ordinary, 100 deferred ordinary, and 1,933 founders' shares taken up. £2,080 paid on 1,983 ordinary and 1,933 founders' shares. £550 considered as paid on 450 ordinary and 100 deferred ordinary shares. Mortgages and charges: nil.

P.R. Products, Ltd.—Debenture dated September 11th, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. N. Strachan, 13, Elm Park Gardens, Fulham.

Wandsworth Electrical Manufacturing Co., Ltd.—Capital £25,000 in £1 shares. Return dated May 26th, 1931. 17,230 shares taken up. £14,365 paid. £2,865 considered as paid. Mortgages and charges, nil.

Waltham Radio, Ltd.—Capital £1,000 in £1 shares. Return dated July 31st, 1931. All shares taken up. £1,000 considered as paid. Mortgages and charges, nil.

Scott Insulated Wire Co., Ltd.—Capital £14,000 in 4,000 preference and 10,000 ordinary shares of £1. Return dated December 14th, 1930 (filed July 27th, 1931). 2,075 preference and 10,000 ordinary shares taken up. £12,705 paid. Mortgages and charges: £2,000 debenture.

Llangefni Electric Light & Power Co., Ltd.—Capital £3,000 in 2,750 preference and 250 ordinary shares of £1 each. Return dated December 31st, 1930 (filed March 6th, 1931). 2,566 preference and 250 ordinary shares taken up. £2,566 paid on the preference shares. £250 considered as paid on the ordinary shares. Mortgages and charges, £700.

Notting Hill Electric Lighting Co., Ltd.—Capital £201,352 10s. in 20,000 cumulative preference shares of £10 and 27,050 deferred shares of 1s. each. Return dated April 14th, 1931. All shares taken up. £201,352 10s. paid. Mortgages and charges, £159,500.

Jeary Electrical Co., Ltd.—Capital £15,000 in 12,000 cumulative participating preference and 3,000 ordinary shares of £1. Return dated November 28th, 1930 (filed April 10th, 1931). 7,000 preference and 3,000 ordinary shares taken up. £7,000 paid on the preference shares. £3,000 considered as paid on the ordinary shares. Mortgages and charges, nil.

City Notes

Ferranti, Ltd.—The accounts of this company were abstracted in our last issue, p. 518, and the annual meeting was held on October 5th. Mr. V. Z. de Ferranti (chairman), who presided, in the course of his speech, said that although the turnover of the business had been well maintained it had not been possible entirely to avoid the effects of the disturbed world conditions, and in consequence they had had a reduction of the trading profit both in England and in Canada. They entered the current year in no pessimistic spirit, as they felt they had a highly efficient organisation for supplying the wants of a growing industry. During the year the Central Electricity Board had placed with them the whole of its requirements for its largest transformers. Considerable progress had been made in the company's products in which the public was directly interested, such as radiant fires, water heaters, &c., and they had just added to these a line of synchronous motor electric clocks. The report and accounts were adopted.

The Jerusalem Electric and Public Service Corporation reports a profit, including a balance brought forward, of £P11,157. After payment of loan interest and the preference dividend, it is proposed to carry forward the balance of £P3,568. The annual meeting was held in Jerusalem on September 30th. Mr. L. Le Bouvier, the local director, who presided in the absence of Mr. W. Shearer, the chairman, read Mr. Shearer's speech, during which he stated that they had continued to extend their system, and at date 22½ miles of overhead lines had been erected and 21½ miles of underground cables laid. The number of consumers taking a supply was over 3,300, and further applications were being received in steady volume for supplies both for lighting and power purposes. Negotiations were in hand with various large prospective consumers. The capacity of the plant at the power station had been increased, and the new plant was now in commission. The extensions authorised to Montefiore, Bukharia and Talpioth had been completed, and a supply was now being given.

Companies to be Struck off the Register.—The names of the undermentioned companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary:—

A.B.C. Daylight and Electric Signs, Ltd.
Electrastorage, Ltd.
Iola (Radio-Gram), Ltd.
Western Electric Railways Development Co., Ltd. ...

The Mexican Light & Power Co., Ltd., has decided to defer the declaration of the dividends on the 7 per cent. cumulative preference and the 4 per cent. cumulative redeemable second preference shares. The main reasons are the recent change of the Mexican monetary system, special taxation, and the necessity for conserving the company's position, having regard to its accruing bond interest and sinking fund payments which must be met out of Canadian funds.

Callender's Cable & Construction Co., Ltd., has declared an interim dividend of 5 per cent., less tax. (Same.)

The North Metropolitan Electric Power Supply Co., Ltd., has announced an interim dividend of 4 per cent., actual, on the ordinary shares. (Same.)

The Midland Electric Corporation for Power Distribution, Ltd., has announced an interim dividend of 2½ per cent. on the ordinary shares. (Same.)

Parsons Marine Steam Turbine Co., Ltd., proposes to pay a dividend of 7½ per cent., less tax, for the year ended June 30th (against 10 per cent., tax free).

Tube Investments, Ltd., has recommended a dividend of 8 per cent. on the ordinary shares, less tax, for the year ending October 31st, and at the relative rate on the liaison ordinary shares.

The Marconi International Marine Communication Co., Ltd., has announced an interim dividend of 5 per cent., less tax. (Same).

Stocks and Shares

TUESDAY EVENING.

After the extraordinary number of changes which occurred in the prices of the stocks and shares quoted overleaf, the falling-off in fluctuations reflects the return of markets to the less abnormal. The departure of this country from the gold standard continues to make its effect felt heavily upon the prices of Stock Exchange securities, the interest on which is paid at fixed rates. There is no recovery, for instance, from their seven point fall of last week in the 4½ per cent. debenture stocks of the Central Electricity Board or of the London and Home Counties' J.E.A. Home Railway prior charge stocks of the best kind remain depressed. British Government securities have rallied, however, very materially from the lowest point which they recently touched. Uncertainties in regard to the issue of a General Election have a usual effect of rendering markets somewhat fidgety and nervous.

The fact that the country is to be plunged into the excitement of a General Election will mean the withdrawal, for the time being, of public interest from stocks and shares. The possibility of the National Party being returned to power is likely to give a fillip to shares in the industrial companies which should benefit from the establishment of a stable Government and the devaluation of the £. It would also have the effect of advancing the level of gilt-edged securities. Heavy falls in Stock Exchange quotations this week in New York and in Montreal emphasise the weakness that prevails overseas, and reinforce the arguments of those who contend that British securities are still the safest in the world.

Dollar Stocks

The influence of the dollar remains potent, and members of the Stock Exchange watch with a touch of anxiety the alteration in foreign rates of exchange as these are posted intermittently during the day around the markets of the House. It is said that many of the large British holders of American utility securities have been quick to take advantage of the remarkable rises that occurred in this group, and of which mention was made here last week, turning out their stocks at the advanced prices and reinvesting the money in British Government issues.

So far as the utilities prices are concerned, Shawinigan Water at 32¼ are 5 points down, Pennsylvania Water retain their rise of 10 dollars at 65. Montreal Light & Power at 44¼ are 3 lower, Power Corporation of Canada at 40 have gone back 5½. San Paulo Tramway fives at 72½ are unchanged. Tokyo Electric sixes at 85¼ have dropped 2 points. American Tele-

phone & Telegraph have gone back from 180 to 165, and Internationals at 19½ are 2 points lower. Brazilian Tractions subsided to 10, which is 3 down.

Electricity Supply Shares

Few movements of consequence have occurred in the prices of the ordinary shares of the Home electricity supply companies. Chelsea ordinary at 27s. show 1s. fall, and Metropolitans have gone back 1s. 3d. to 38s. North Metropolitans dropped to 42s. The company has declared an interim dividend of 4 per cent., as last year. The rest of the list has been so little tested by business that it is difficult to describe the tone by any other word than colourless. The preference shares, in which group there were a number of falls last week, are left at the lower figures. It should be noted, however, that instead of there being a preponderance of sellers of preference shares, as was the case last week, a good many inquiries have come forward on the part of bargain-hunters who bid a little under market prices and who are, perhaps, somewhat surprised at finding they cannot deal at their own quotations. The floating supply of shares is still small, and the security which most of the good preference shares offer is sound enough to attract prospective purchasers wishing to take advantage of the fall.

Northampton ordinary are quoted at 36s. 3d., Electrical Distribution of Yorkshire at 30s. Some of the other provincial shares are a little easier. Newcastle-on-Tyne ordinary receded to 22s.; Midland Electric Power at 27s. 6d. have gone back a few pence. The company has announced its usual interim dividend of 2½ per cent. on the ordinary shares.

Cables and Wireless

In the telegraph and telephone group, some inquiry has sprung up for Globe Telegraph and Trust ordinary shares. The price, which had been down to the neighbourhood of 5, has recovered to 6. The demand arose by reason of the pointing out here that the cheapest way to take an interest in the three stocks of Cables & Wireless was through the medium of a purchase of Globe ordinary shares. The Globe Telegraph and Trust Company holds very substantial blocks of the stocks, and analysis of the company's last issued accounts will show that, through a purchase of Globe shares, an interest could be acquired in Cables & Wireless Preference on the basis of 25 to 30. The market price is 43½, which shows a fall of 2 points on the week. The "A" ordinary stock is 1 higher, and the "B" 1 lower, on balance. Anglo-American Telegraph preferred, after its drop of 5 points, is again easier at 95½, in correspondence with the disposition of fixed-interest securities of all kinds. The deferred stock is a point down at 23. Great Northern Telegraphs parted from their gain of £1 which they secured last week, and Marconi Marines reacted to 31s. 3d. The 4 per cent. debenture stocks of the Eastern Telegraph and the Western Telegraph Companies have been lowered to 77½. Telegraph Constructions at 12 have risen £1. Western Union common, after being 120, went back to 110.

Home Railways and Traction

Lower prices are quoted for Central London Railway stocks. The assented ordinary, preferred and deferred have fallen to the common price of 71½, showing a drop of 3½ on the week. The unassented stocks are flat, the ordinary being quoted at 54½, the preferred at 52, and deferred at 61½. London Electric ordinary stands at 58½. Underground Electrics have firmed up to 18s. Metropolitans and Districts are both a point lower. Of the prior-charge stocks, Underground 5 per cent. first mortgage at 87½, and the company's 6 per cent. income debenture at 86½, are both 2 points down. In the tramway list, London United preference keep steady at 10s., and the 4 per cent. debenture stock of the London United Tramways remains at 60½. British Electric Traction preferred has fallen 7½ points to 105. The deferred is quoted at 650.

Manufacturing and Equipment

British Aluminium ordinary shares have been undergoing sharp fluctuations, and the rise of 7s. 6d. last week is followed by a reaction of 2s. 6d. to 27s. 6d. The 6 per cent. preference shares can be bought at 17s. 3d. or thereabouts. An interim dividend of 5 per cent. has been declared on Callender's ordinary, which is a repetition of the distribution a year ago. The 6½ per cent. preferences have again fallen ½, the price now being 21s. 3d. Edison Swan first preference declined to 22s. 9d., General Electric 6½ per cent. preference to 22s. 6d., and Henley preference to 4¼. These falls are due to the rearrangement of investment values rendered necessary by the rise in the Bank Rate and the suspension of the gold standard. On the other hand, the ordinary shares still continue in demand. Johnson & Phillips have risen ½ to 27s. 6d., Henleys the same fraction to 5½. General Electrics have fallen sharply to 39s. 6d. Associated Electrical Industries at 19s. 6d. have shed half their gain of last week. It is possible that American holders of General Electrics and Associated Electricals have been realising their shares on this side in order to meet liabilities incurred in New York.

The iron and steel market shows a good deal of strength and has reacted but little from the top. Prices are not greatly altered. Babcock & Wilcox remain at 50s., Vickers are a good market at 9s. 4½d. The rubber share market has fallen back into somnolence, in consequence of the raw material going back to the neighbourhood of 3d. per lb.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Oct. 6, 1931.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	£1	15	15	58/9	—	5 2 2
Brompton Ordinary	£1	8½	8½	28/6	—	4 18 3
Central Electricity 4½% Deb.	Stock	—	4½	87½	—	5 2 10
Charing Cross Ordinary	£1	8½	8½	29/0	—6d.	4 16 7
Chelsea	£1	8½	8½	27/–	—1/–	5 3 8
City of London	£1	10	10	35/–	—	5 14 3
Clyde Valley	£1	8	8	31/3	—	5 2 4
County of London	£1	11	11	43/3	—	5 1 9
Edmundsons' 7% Pref.	£1	7	7	24/6	—6d.	5 14 3
Elec. Supply Corporation	£1	11	11	42/6	—	5 3 6
Kensington Ordinary	£1	8	8	29/–	—	4 16 7
Lancs. Light and Power	£1	7	6½	23/6	—	5 10 8
London & Home Counties 4½% Deb.	Stock	—	—	87½	—	5 2 10
London Electric	£1	8½	9	32/6	—	5 10 9
Metropolitan	£1	9	10	37/6	—½	5 6 8
Midland Counties	£1	6½	7	27/6	—	5 1 10
Mid. Elec. Power	£1	15	8	27/6	—9d.	5 16 5
Newcastle-on-Tyne Ordinary	£1	6	6	22/–	—½	5 9 1
Do. 7% Pref.	£1	7	7	25/–	—	5 12 0
Notting Hill 6% Pref.	£10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	£1	6	6	22/–	+6d.	5 9 1
St. James' and Pall Mall	£1	8	8	29/–	—	4 16 7
Scottish Power	£1	8	8	27/–	—	5 18 6
South London	£1	8½	8½	26/6	—	5 5 8
Urban Ordinary	£1	7	7	27/6	—9d.	5 1 10
Westminster Ordinary	£1	8½	8½	28/–	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	£1	7½	7½	21/–	—	7 2 10
Yorkshire Elec.	£1	8	8	31/3	—	5 2 5

Home Rails

Central London Ord. Assented	Stock	4	4	71½	—3½	5 12 3
Metropolitan	£	4	3½	35½	—1	9 16 6
Do. District	£	5	—	57½	—1	8 13 10
Underground Electric	£1	8	8	18/–	+6d.	8 17 10

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	95½	—1	6 5 4
Do. Def.	£	1½	1½	23	—1	6 10 5
Cables & Wireless 5½% Pref.	Stock	5½	5½	43½	—2	—
Do. A 7½% Ord.	£	Nil	—	13	+1	—
Do. B Ord.	£	Nil	—	8	—1	—
Globe Tel. and T. Ord.	£10	10	8½	6	+½	—
Do. do. Pref.	£10	6	6	6½	—½	9 12 0
Great Northern Tel.	£10	20	20	22½	—1	8 17 10
Marconi-Marine	£1	15	15	31/3	—⅛	9 12 0
Oriental Telephone Ord.	£1	12	12	2½	—	*5 12 11

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	£5	5½	—	7/6	—	—
Do. do. 2nd Pref.	£5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	11½	—6½	—
British Electric Traction Def. Ord.	£	5	5	650	—	—
Do. do. Pref. Ord.	£	8	8	105	—7½	7 12 5
Brazil Traction	£100	8	—	10	—3	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	90	—3	5 11 1
London & Sub. Trac. 5% Pref.	£1	Nil	Nil	10/–	—	—
London United Tram Deb.	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	25	—2½	20 0 0
Mexican Light Common	£100	Nil	Nil	20	—	—
Do. 7% Pref.	£100	7	7	35	—15½	20 0 0
Do. 1st Bonds	—	5	5	52½	—5	9 10 6
Victoria Falls Ord.	£1	15	15	63/–	—⅛	5 0 0
Yorkshire (West Riding)	£1	Nil	Nil	6/3	—	—

Manufacturing Companies

Assoc. Elec. Ord.	£1	6	6	19/6	—⅝	6 3 1
Do. Pref.	£1	8	8	25/–	—	6 8 0
Babcock & Wilcox	£1	15	14	50/–	—	*5 12 0
British Aluminium Ord.	£1	10	10	27/6	—½	7 8 2
British Insulated Ord.	£1	15	15	2	—	5 4 4
Brush Ord.	Stock	10	5	55	—	9 1 10
Callenders	£1	15	15	2½	—	5 4 4
Do. 6½% Pref.	£1	6½	6½	21/3	—½	6 2 4
Crompton Parkinson Ord.	5/–	30	30	22/6	—	6 13 4
Do. 8% Pref.	£1	8	8	28/3	—	5 13 3
Edison-Swan 1st Pref.	£1	7½	7½	22/9	—6d.	6 11 10
Do. 5% Deb.	Stock	5	5	92½	—	5 8 1
Electric Construction	£1	5	Nil	10/–	—	—
Enfield Cable Ord.	£1	25	25	3½	—	6 11 0
English Electric	£1	Nil	Nil	5/–	—	—
Do. do. Pref.	£1	Nil	Nil	5/–	—	—
Ferranti Pref.	£1	7	7	20/–	—	7 0 0
G.E.C. Pref.	£1	6½	6½	22/6	—6d.	5 15 7
Do. Ord.	£1	14	10	39/6	—8/–	5 1 3
Henley	£1	30	30	5½	+¼	5 9 1
Do. 4½% Pref.	£5	4½	4½	4½	—½	5 6 0
India-Rubber	£1	Nil	Nil	4/6	—	—
Johnson & Phillips	£1	10	10	27/6	+½	7 5 6
Siemens Ord.	£1	7½	7½	23/9	+⅛	6 6 0
Telegraph Construction	£12	10	7½	12	+1	7 10 0

* Dividends paid free of Income Tax.

Our Overseas Electrical Trade

Some Details of the Distribution of 1930 Exports

VOLUME III (Exports) of the annual statement of the overseas trade of the United Kingdom has now been published (H.M. Stationery Office, price 17s. 6d. net). It gives in much greater detail than the monthly accounts the statistics of shipments of the various classes of electrical apparatus and machinery and of their destinations. From this volume has been compiled the following table showing most of the principal items of apparatus and machinery exported, together with the outstanding countries of destination in 1930; the figures for 1929 have been inserted for purposes of comparison and notes of increases or decreases added. The goods and apparatus group (including cables) is summarised in a table giving the total values shipped to the different customer countries, but no such table is given in connection with the machinery group.

	1929.	1930.	Inc. or Dec. Thousands of £.
Electric wires and cables, insulated.			
Rubber insulated (not telegraph or telephone)—			
Total	1,630	1,234	— 396
To Port. E. Africa	26	25	— 1
„ Argentina	88	77	— 11
„ South Africa	145	152	+ 7
„ India	305	220	— 85
„ Australia	467	310	— 157
„ New Zealand	113	90	— 23
Insulation, other than rubber (not telegraph or telephone)—			
Total	1,762	1,680	— 82
To China	60	35	— 25
„ Brazil	69	57	— 12
„ Argentina	137	273	+ 136
„ South Africa	170	137	— 33
„ India	309	290	— 19
„ Straits Settlements	74	45	— 29
„ Australia	518	446	— 72
Telegraph and telephone wires and cables—			
Total	1,118	827	— 291
To Spain	187	2	— 185
„ Chile	71	14	— 57
„ Brazil	100	81	— 19
„ Argentina	80	154	+ 74
„ Australia	251	118	— 133
„ New Zealand	77	69	— 8
Submarine telegraph and telephone cables—			
Total	424	803	+ 379
To Spain	89	24	— 65
„ Italy	92	354	+ 262
„ United States	86	222	+ 136
Telegraph and telephone instruments and apparatus—			
Wireless (except valves)—			
Total	950	850	— 100
To Holland	129	121	— 8
„ Italy	49	75	+ 26
„ Japan	63	19	— 44
„ Irish Free State	51	46	— 5
„ South Africa	34	74	+ 40
„ India	42	36	— 6
„ Australia	91	59	— 32
Other instruments and apparatus—			
Total	1,892	1,550	— 342
To Spain	85	52	— 33
„ Egypt	103	64	— 39
„ Chile	99	64	— 35
„ Argentina	395	199	— 196
„ Straits Settlements	89	12	— 77
„ Australia	367	260	— 107
Wireless valves—			
Total	227	312	+ 85
To France	9	52	+ 43
„ Irish Free State	12	13	+ 1
„ South Africa	14	17	+ 3
„ Australia	48	62	+ 14
Glow lamps (20 v. and over).			
Gasfilled—			
Total	337	312	— 25
To Argentina	14	15	+ 1
„ South Africa	47	27	— 20
„ India	37	40	+ 3
„ Australia	125	124	— 1
Other—			
Total	299	253	— 46
To India	29	32	+ 3
„ Australia	125	107	— 18
Glow lamps (under 20 v.).			
For flash lamps	2	1	— 1
Other	24	23	— 1
Accumulators (including parts).			
Portable—			
Total	443	363	— 80
To Denmark	44	46	+ 2
„ India	92	52	— 40
„ Australia	76	14	— 62
„ Canada	29	69	+ 40
Stationary—			
Total	417	365	— 52
To Holland	26	22	— 4
„ India	119	121	+ 2
„ Australia	99	28	— 71
„ Canada	19	12	— 7
Lighting accessories and fittings (including switches)—			
Total	724	600	— 124
To Argentina	44	37	— 7
„ Irish Free State	47	55	+ 8
„ South Africa	77	62	— 15
„ India	123	36	— 87
„ Straits Settlements	26	15	— 11
„ Australia	135	70	— 65
„ New Zealand	57	52	— 5
Commercial instruments (including ammeters, voltmeters, etc.)—			
Total	160	138	— 22
To South Africa	17	17	— —
„ India	36	30	— 6
„ Australia	29	24	— 5
House service meters—			
Total	152	110	— 42
To South Africa	12	12	— —
„ India	35	21	— 14
„ Australia	12	5	— 7
„ New Zealand	31	22	— 9
Switchboards (other than telegraph and telephone)—			
Total	64	89	+ 25
Total value of goods and apparatus—			
To Foreign countries	5,551	5,449	— 102
„ Sweden	122	179	+ 57
„ Denmark	132	185	+ 53
„ Holland	337	252	— 85
„ Belgium	121	173	+ 52
„ France	236	360	+ 124
„ Spain	486	181	— 305
„ Italy	500	560	+ 60
„ Egypt	311	179	— 132
„ China	209	198	— 11
„ Japan	227	89	— 138
„ United States	281	360	+ 79
„ Chile	255	155	— 100
„ Brazil	315	301	— 14
„ Argentina	932	1,012	+ 80
„ British countries	7,608	6,478	—1130
„ Irish Free State	397	403	+ 6
„ South Africa	831	829	— 2
„ India	1,609	1,386	— 223
„ Straits Settlements	357	199	— 158
„ Malay States	126	157	+ 31
„ Hong Kong	182	119	— 63
„ Australia	2,547	1,780	— 767
„ New Zealand	696	600	— 96
„ Canada	251	305	+ 54
Electrical Machinery, etc.—			
Generators.			
A.c.—			
Total	699	876	+ 177
To Soviet Union	107	90	— 17
„ Japan	50	23	— 27
„ Argentina	33	40	+ 7
„ South Africa	53	57	+ 4
„ India	102	104	+ 2
„ Australia	90	91	+ 1
„ Canada	57	51	— 6
D.c.—			
Total	416	303	— 113
To Japan	49	2	— 47
„ Argentina	21	17	— 4
„ South Africa	21	32	+ 11
„ India	148	101	— 47
„ Australia	36	20	— 16
Motors.			
Traction—			
Total	294	182	— 112
To Brazil	8	20	+ 12
„ Argentina	14	56	+ 42
„ India	95	76	— 19
„ Australia	112	9	— 103

	1929.	1930.	Inc. or Dec.
	Thousands of £.		
Other motors, a.c.—			
Total	727	719	— 8
To France	14	15	+ 1
„ China	13	10	— 3
„ Brazil	24	16	— 8
„ Argentina	23	29	+ 6
„ South Africa	68	62	— 6
„ India	146	114	— 32
„ Straits Settlements ..	25	11	— 14
„ Australia	109	69	— 40
„ New Zealand	48	48	— —
„ Canada	79	110	+ 31
Other motors, d.c.—			
Total	449	376	— 73
To Holland	30	39	+ 9
„ France	21	21	— —
„ South Africa	31	29	— 2
„ India	74	57	— 17
„ Australia	61	37	— 24
„ Canada	44	45	+ 1
Convertors and transformers.			
Rotary—			
Total	235	180	— 55
To Japan	19	12	— 7
„ Argentina	17	10	— 7
„ India	115	19	— 96
„ Australia	12	52	+ 40

	1929.	1930.	Inc. or Dec.
	Thousands of £.		
Static—			
Total	531	742	+ 211
To Soviet Union	10	90	+ 80
„ China	20	10	— 10
„ Brazil	22	13	— 9
„ South Africa	61	86	+ 25
„ India	63	62	— 1
„ Straits Settlements ..	44	9	— 35
„ Australia	102	75	— 27
„ New Zealand	71	95	+ 24
Control and switchgear—			
Total	1,775	1,950	+ 175
To Soviet Union	133	112	— 21
„ Holland	65	68	+ 3
„ China	51	41	— 10
„ Brazil	87	45	— 42
„ Argentina	33	141	+ 108
„ South Africa	171	154	— 17
„ India	385	328	— 57
„ Straits Settlements ..	43	23	— 20
„ Australia	294	319	+ 25
„ New Zealand	66	130	+ 64
„ Canada	51	55	+ 4
Electrical machinery n.e.s.—			
Total	1,160	956	— 204
To foreign countries	477	417	— 60
„ British countries	683	956	+ 273

A South London Display

IN April last year the London Electric Supply Corporation, Ltd., opened an electrical exhibition at 199-201, Lewisham High Road, S.E., and the venture proved so successful that it was decided to establish permanent showrooms. Work was commenced on the reconstruction of the interior, resulting in a spacious and well-arranged general showroom and an all-electric flat which is a model of modern comfort.

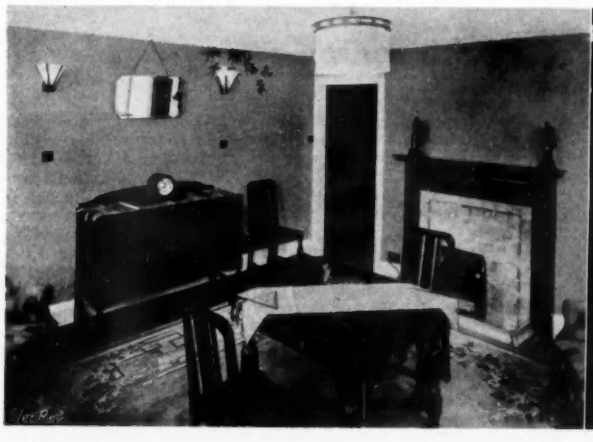
The first room to be approached on ascending the stairs is the kitchen, and here are found cookers, a water heater, a refrigerator, a washing machine, and a vacuum cleaner. This room can comfortably accommodate a score of people during demonstrations of electric cooking, &c. The bedroom is heated by a 1-kW fire, while the lighting fittings include a double fitting over the dressing table, a fitting suspended over the bed, and a table standard. The bathroom is tastefully decorated and a water heater is erected over the bath.

The living room is a spacious, airy room and here the opportunity has been taken of displaying various lighting fittings. Suspended in the centre of the room is a chandelier, while around the walls are brackets of various designs, yet all harmonising with the surroundings. The electrical equipment of this room is completed with an imitation coal fire and an all-mains radio receiver. The corridor is illuminated by electric lanterns. The decorations of the flat are in warm colours and the general lay-out creates a cosy atmosphere. A feature in all the rooms is the position of the wall sockets, which are placed at waist level so that it is possible to "plug in" without stooping. The main showroom on the ground floor is decorated in oak panelling and dove-grey colouring. Its expanse enables a large variety of domestic appliances to be set out to advantage, while at the rear there is a well-equipped demonstration room, fitted as a lecture room, where it is the company's intention to give demonstrations, lectures (for adults and juveniles), and lessons in electric cooking and the use of domestic appliances. The showroom window, when we paid our visit, was dressed to draw attention to the Faraday Centenary celebrations and to show the advance which has been made in domestic comfort during the past century. One side of the window displayed domestic appliances in use in 1831, while the other contained appliances illustrating the latest electrical apparatus for use in the home.

The company is drawing the attention of its consumers to its latest venture by advertising in the local Press and by circularising all houses in streets in which its mains are laid with an invitation to visit the showrooms. It has no assisted wiring scheme, preferring to leave the wiring of houses in the hands of local contractors, but it has a scheme under which it hires out electric cookers, water heaters, and electric fires at reasonable quarterly charges. It also has an "all-in" domestic tariff.

The electrical installation of the showrooms was carried out by Mr. W. W. Williams, and the internal structural alterations by Messrs. Oldham & Son to the design of Messrs. Lansdowne & Brown.

The Model Electric Kitchen



The Demonstration Room

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Cable Manufacturing Developments

I read with interest the article published in your issue of August 21st concerning the straight-through lead sheathing press developed by W. T. Henley's Telegraph Works Co., Ltd.

The information contained in the article with regard to the flow of lead and the meeting of the lead streams in the die block of the vertical type is, of course, well known amongst cable makers, as is also the fact that the weld between the two lead streams can be shown by etched samples, but it is also more than well established that the weld is a safe one by the fact that millions of lengths of cable have been sheathed by this process, and have been in operation for long periods of years without trouble.

The ability of the Henley press to produce a reliable lead sheath as efficiently as the present vertical type will no doubt be watched with interest by all cable manufacturers, who fully appreciate that there are many features which must be controlled in order to obtain a satisfactory sheath, other than those associated with the formation of lead streams by the die block. If the straight-through press in any way adds to the overall economy of the utilisation of lead sheath for the protection of cable it will be a contribution of real merit.

T. C. S. SPENCER,
Director of Cable Manufacture,
Standard Telephones and Cables, Ltd.

October 3rd, 1931.

Meter Test Houses

I would like to point out an error in my previous letter, published in your issue of October 2nd. The number of consumers of the undertaking in question was stated to be 8,000, whereas the official figures of the undertaking for the year ended March, 1931, show the number of connections to be 34,294. The number has been considerably increased up to date, and gives an added importance to the work of the meter department.

H. J. ARTHUR.

Wolverhampton, *October 4th*, 1931.

Station Engineers for Mains Work

The writer was very pleased to read the remarks of Capt. J. M. Donaldson reported in the ELECTRICAL REVIEW of the 2nd inst., to the effect that power station engineers could adapt themselves to mains engineering appointments.

In order to improve my position I resigned from a responsible power station appointment in Singapore, but since my return home, as good station appointments have been very scarce, I have had to make application for positions of mains assistant. My applications have been turned down by mains chiefs on the ground that I am a power station man.

Cannot some consideration be given to the claims of power station engineers? They are surely clever enough for mains appointments, and have been trained both mechanically and electrically, and there are some very good power-station-mains engineers.

G. E. WALKER.

Colchester, *October 2nd*, 1931.

The Voltage of High-frequency Tools

Ever since the introduction of electric power into industrial establishments it has suffered from the competition of compressed air which was introduced about the same time. Compressed air had the advantage of lighter weight and less liability to break down through overloading, but it had the outstanding disadvantage of high cost of power. It requires approximately 5 h.p. at the air compressor motor to get 1 h.p. delivered to the tool. Compressed air also had the advantage of immunity from shock, which, although considerably reduced by the efficient way in which our Home Office Electrical Inspector and his staff have administered the regulations with regard to earthing, is nevertheless present with electricity (because earth connections do break or become faulty), and prejudices the worker and his employer against portable electric tools.

A new factor has been introduced with the use of high-frequency currents for the operation of electric tools, and there are now many examples of such installations in successful operation both in England and abroad, chiefly in automobile plants, but also in shipyards and general engineering works. The disadvantages inherent in standard electric tools have been eliminated. Weight is now comparable with that of compressed air tools, reliability is even greater, cost of power remains very much what it was for standard electric tools, the increase in losses due to conversion from d.c. or 50-cycle a.c. to from 150 to 200 cycles is almost negligible, leaving an overwhelming advantage in favour of high-frequency tools.

As the high-frequency current is generated for a specific purpose, and can be conveniently converted at any desired pressure, why not use 110 volts for the purpose? The question of copper area does not seriously affect the problem, as the extra copper exists only between the frequency converter and the tool.

In the metallurgical industry, where the work usually provides an excellent "earth," and, therefore, a risk of shock, the lowest practicable voltage should be used on the score of safety. One of the largest shipbuilding firms in the world, as a result of several years of experience, laid down special 110-volt mains all over its yard to operate electric tools, although it already had a 220-volt installation for power purposes.

Another shipyard was recently equipped with 110-volt high-frequency plant under similar conditions. Abroad, particularly in Holland and Belgium, there exists in official circles a decided preference for lower voltages (even 70 volts for a.c. portable tools has been suggested), and the Factories Inspector of the Dutch Government proposes to make this question of voltage on portable electric tools a subject for discussion at the next international electrical congress. Everything, therefore, points to the desirability of standardising a safer voltage for tools, particularly as the British firms already in the business have done their best to conform to a voltage of 110, though in doing so they appear to have aroused the hostility of their American competitors.

Now that high-frequency tools have made portable electric tools effective competitors of compressed air, it would be a great pity if they were to achieve only a partial success because firms selling the tools did not adopt the safest possible voltage in the interests not only of the workers who use the tools, but of the electrical manufacturing industry which now has the chance of invading and capturing a field that absorbs thousands of air drills per annum.

October 3rd, 1931. ELECTRA.

The Cleaning of Silver

For the attention of the E.D.A. and the E.A.W.—In these days of harassed housewives and incompetent maids it is almost impossible to keep one's silver decently bright. A fractional horse-power motor with the requisite buffing wheels, at a price within the reach of everyone, would be a great boon; if properly advertised in the papers read by women the sales might be comparable to those of electric irons. If such an article is on the market now it manages to keep well out of the public eye, and the trade article is far too expensive.

J. W. MEARES.

Chichester, *September 29th*, 1931.

Electrical Developments in Turkey

Increased Electrical Imports

THE question of the electrification of Turkey is discussed in the Bulletin of the Société d'Etudes et d'Informations Economiques, of Paris, on the basis of information published in the Turkish Press. During the four years ended with 1930, it is stated, about thirty generating stations were either constructed or were in course of establishment. At present three large schemes are under consideration. The first is based upon the coal mines in the Zoungouldak basin, while the other two are hydro-electric schemes which would utilise the energy of two rivers in Central Anatolia, namely, the Kizil-Irmak and the Sakkariya. The first- and last-mentioned are destined to serve for the supply of Constantinople and Angora. For the moment the scheme for a steam power station in the Zoungouldak basin, which would involve an expenditure of 120,000,000 fr. has prospects of being carried out. Hitherto all works of this kind have been executed by foreign undertakings, chiefly Belgian and German, but German preeminence is diminishing in the face of efforts now being made by the Italian, Swedish, Czech, and Hungarian firms.

The work of electrification has brought about a material increase in the imports of foreign machinery, which rose from 423 tons in 1924, to 1,702 tons in 1929, the augmentation having amounted to 625 per cent. in this period in the group comprising generators, motors and accumulators. In this respect the Germans continue to occupy the first place as suppliers. The share of Germany in the total imports of electrical machinery and plant is stated to have been 57 per cent. in 1926, 48.5 per cent. in 1927, 52 per cent. in 1928, 44.4 per cent. in 1929, and 63 per cent. in the first half of 1930.

According to the industrial census, there are 97 electricity undertakings in Turkey, of which 37 belong to companies, 26 to private individuals, and the remainder to local authorities. Of this number 82 stations are operated by steam, 13 by water-power, and 2 are of a mixed character. The total annual production is stated to be 81,700,000 kWh, of which 52,150,000 kWh is generated at the Constantinople station.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1930

6,989. "Electrical discharge devices." Schering-Kahlbaum Akt.-Ges. March 2nd, 1929. (356,689.)

7,049. "Testing of electrical and/or magnetic characteristics of metal sheets." Ferranti, Ltd., and E. D. T. Norris. March 4th, 1930. (356,690.)

7,116. "A.c. induction electricity meters." A. Kupeczek and Measurement, Ltd. March 4th, 1930. (356,718.)

7,849. "Electrical reception and transmission of pictures." O. Von Bronk. March 11th, 1930. (Patent of addition not granted.) (356,760.)

7,935. "Continuous-current motors." Akt.-Ges. Brown, Boveri et Cie. May 30th, 1929. (356,762.)

10,646. "Acoustic condensers." Dubilier Condenser Co. (1925), Ltd. April 3rd, 1929. (356,778.)

11,208. "High-potential transformers." Koch & Sterzel Akt.-Ges. April 30th, 1929. (356,693.)

11,340. "Electric accumulators." H. Salmon, E. T. Williams, and Expanded Metal Co., Ltd. April 9th, 1930. (Patent of addition not granted.) (356,780.)

13,921. "Moving iron phase meter for unbalanced polyphase circuits." Compagnie pour la Fabrication des Compteurs et Material d'Usines à Gaz. May 6th, 1929. (356,699.)

14,090. "Thermionic valve systems." H. Andrewes and J. Robinson. May 7th, 1930. (356,782.)

14,728. "Electric control systems." R. J. Stevens. May 13th, 1930. (356,788.)

16,961. "Process for bleaching molasses by means of electrolytic treatment and the manufacture of yeast therefrom." J. W. Thompson and J. W. Hinchley. June 2nd, 1930. (356,703.)

17,019. "Radio receiving apparatus." British Thomson-Houston Co., Ltd., and T. H. Kinman. June 2nd, 1930. (356,726.)

17,034. "Cable jacket consisting of a flexible, waterproof, seamless piping, in particular for long-distance sea cables and oil-filled high-tension cables." Siemens-Schuckertwerke Akt.-Ges. June 18th, 1929. (356,706.)

17,226. "Continuously-loaded signalling cables." Standard Telephones & Cables, Ltd., G. Lawton and W. H. Dearden. June 4th, 1930. (356,709.)

17,301. "High-potential transformers." Koch & Sterzel Akt.-Ges. June 5th, 1929. (Addition to 356,693.) (356,710.)

17,365. "Brake-actuated electric switch control mechanisms." A. G. Westmoreland. June 5th, 1930. (356,744.)

17,436. "Luminous electric discharge tubes." Claude Neon Lights, Inc. November 30th, 1929. (356,745.)

17,461. "High-potential transformers." Koch & Sterzel Akt.-Ges. June 6th, 1929. (Addition to 356,693.) (356,746.)

17,478. "Photo-electric cells." Gramophone Co., Ltd., and W. F. Tedham. June 5th, 1930. (356,747.)

17,581. "Voltage regulators for electrical transformers." British Electric Transformer Co., Ltd., and A. C. Whish. June 6th, 1930. (356,714.)

17,582. "Process for the manufacture of oxide cathodes for electric discharge tubes." Egysult Izzolampa Es Villamossagi Reszvenytarsasag. December 23rd, 1929. (356,715.)

17,611. "High-potential transformers." Koch & Sterzel Akt.-Ges. June 7th, 1929. (Addition to 356,693.) (356,750.)

17,621. "Snap-action electric switches." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). June 6th, 1930. (356,753.)

18,028. "Lead calcium alloys for sheathing cables." Standard Telephones & Cables, Ltd. October 30th, 1929. (356,801.)

18,029. "Photo-electric cells." Standard Telephones & Cables, Ltd. (Matériel Téléphonique). June 12th, 1930. (356,802.)

18,030. "Alternating-current relays." Standard Telephones & Cables, Ltd., E. K. Sandeman, T. S. Skillman, and B. B. Austin. June 12th, 1930. (356,803.)

18,104. "Electric switches with arc-extinction by self-generated vapour pressure." Siemens-Schuckertwerke Akt.-Ges. September 4th, 1929. (356,804.)

18,140. "Automatically-regulated dynamos." J. Lucas, Ltd., and W. H. Glaser. June 13th, 1930. (356,807.)

18,207. "Oil-controlled motor ignition." W. E. Albertson and M. D. Moody. June 13th, 1930. (356,812.)

18,224. "Sound transmission systems." Electrical Research Products, Inc. June 14th, 1929. (356,813.)

18,297. "Telegraphic or like signalling systems." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). June 14th, 1930. (356,815.)

18,495. "Automatically-operated electric switches." W. Hensman. June 17th, 1930. (356,830.)

18,548. "Cartons for electric lamps or the like." L. Marks and W. J. Wood. June 17th, 1930. (356,831.)

20,124. "Machine for manufacturing quadruple conductors for telephone cables." Allgemeine Elektricitäts-Ges. July 3rd, 1929. (356,852.)

20,519. "Electric water-heaters." W. E. Barron. July 7th, 1930. (356,857.)

22,014. "Television and like systems." Marconi's Wireless Telegraph Co., Ltd. July 19th, 1929. (356,880.)

23,421. "Photo-electric cells." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 26th, 1930. (Addition to 319,650.) (356,895.)

23,692. "Submarine electric communication cables." Siemens-Schuckertwerke Akt.-Ges. August 9th, 1929. (356,899.)

24,113. "Electric motors." Dual Motors, Ltd. October 5th, 1929. (356,902.)

24,183. "Electric induction furnaces." Associated Electrical Industries, Ltd. August 14th, 1929. (356,903.)

24,399. "Cathode beam oscillographs." Associated Electrical Industries, Ltd. August 14th, 1929. (356,904.)

24,597. "Means for the enclosure of fusible electric cut-outs." W. T. Henley's Telegraph Works Co., Ltd., and W. H. Nichols. August 16th, 1930. (356,908.)

24,622. "Electric heaters for heating and keeping hot internal-combustion engines and the cooling-medium thereof when the engine is not in use." W. H. Bulpitt and Bulpitt & Sons, Ltd. August 18th, 1930. (356,909.)

25,585. "Electric induction motors." International General Electric Co., Inc. August 29th, 1929. (356,924.)

26,057. "Dynamo-electric mine igniting-devices." K. Schaffler and N. Spartalis (trading as Schaffler & Co.). November 9th, 1929. (356,932.)

26,798. "Electric ignition distributers." British Thomson-Houston Co., Ltd., W. E. Gough, and G. Tabberer. September 8th, 1930. (356,940.)

27,541. "Manufacture of transformers, loading coils, and the like." General Electric Co., Ltd., and N. R. Bligh. September 15th, 1930. (356,947.)

28,758. "Electrically driven flyers for spinning and like machines." International General Electric Co., Inc. September 25th, 1929. (356,954.)

29,406. "Electric motors." International General Electric Co., Inc. October 1st, 1929. (356,959.)

29,658. "Electric transformers." Micanite & Insulators Co., Ltd., Dr. G. E. Haefely. British Thomson-Houston Co., Ltd., and F. H. Clough. October 3rd, 1930. (356,960.)

30,161. "Electron-discharge devices." British Thomson-Houston Co., Ltd. October 8th, 1929. (356,964.)

30,912. "Arrangement for damping oscillations of overhead electric conductors." Vereinigte Aluminium-Werke Akt.-Ges. October 26th, 1929. (356,967.)

31,754. "Electric discharge tubes." Telefunken Ges. für Drahtlose Telegraphie. November 9th, 1929. (356,978.)

31,799. "Totalisators." Ericsson Telephones, Ltd., and F. Limb. October 23rd, 1930. (356,980.)

32,004. "Process for manufacturing insulating bodies for sparking-plugs." Siemens & Halske Akt.-Ges. March 13th, 1930. (356,983.)

32,047. "Incandescent electric lamps, electron-discharge devices, and the like." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 9th, 1929. (356,984.)

32,533. "Thermionic valve circuits for frequency multiplication." C. Lorenz Akt.-Ges. November 9th, 1929. (356,988.)

34,092. "Electric circuit-making and -breaking apparatus." British Thomson-Houston Co., Ltd. November 16th, 1929. (356,998.)

34,348. "Electron-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 31st, 1930. (357,002.)

35,445. "Wireless aerials." A. E. Sanders. November 25th, 1930. (357,014.)

36,002. "Electric cigarette and like lighters." F. Kallai. November 29th, 1930. (357,020.)

36,329. "Method for transmitting a plurality of communications." W. P. C. Van Der Horst. December 4th, 1929. (357,024.)

37,499. "Electrically operated refrigerating mechanism." W. W. Triggs (Williams Oil-O-Matic Heating Corporation). December 12th, 1930. (357,027.)

38,796. "Crucibles for electrolysis of fused electrolytes." H. Baron (Siemens & Halske Akt.-Ges.). December 23rd, 1930. (357,032.)

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2,282. "Furnace electrodes." Vereinigte Aluminium-werke Akt.-Ges. January 23rd, 1930. (357,047.)

2,337. "Electric impulse transformers." Standard Telephones & Cables, Ltd. June 6th, 1930. (357,049.)

5,146. "Electric arc-welding." International General Electric Co., Inc. February 18th, 1930. (357,062.)

7,050. "Electrically driven hydraulic pressure-producing apparatus." International General Electric Co., Inc. March 7th, 1930. (357,069.)

9,914. "Electrical signalling and control systems." R. J. Stevens. May 13th, 1930. (Divided application on 356,788.) (356,820.)

14,048. "Measuring and like apparatus for electric circuits." International General Electric Co., Inc. May 14th, 1930. (357,078.)

23,047. "Apparatus for controlling the speed of a d.c. electric motor." A. Reyrolle & Co., Ltd., and F. N. Linstow. June 5th, 1930. (Divided application on 17,362/30.) (356,730.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 30th:—

Nitrolyte. No. 525,136. Class 1. Chemical substances for use in electrical batteries. No. 525,135. Class 8. Electric batteries (not for medical purposes).—Nitrolyte, Ltd., Polebrook House, Golden Square, W.1.

Rola. No. 521,536. Class 8. Wireless telephonic and telegraphic apparatus and parts thereof.—The Rola Co., 2570, Superior Avenue, Cleveland, O., U.S.A. (British representatives: Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

Redkap. No. 522,626. Class 8. Loud speaker units and transformers.—S. Kalisky (Aldgate), Ltd., 75, High Street, E.C.3.

Artavian. No. 524,941. Class 8. Apparatus and instruments for the recording, reproduction, transmission, and reception of sound.—The Barnstaple Loud Speaker Co., Ltd., Artavian Works, Newport Road, Barnstaple.

Brittica. No. 525,068. Class 8. Primary and secondary batteries.—Britannia Batteries, Ltd., Britannia House, 233, Shaftesbury Avenue, W.C.2.

Memkuka. No. 525,135. Class 13. Electric switches, fuses, and switch-fuses, and boxes or casings therefor, distribution panels, junction boxes, electric cable connections and conduits, all being metal goods.—The Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Barford Street, Birmingham.

Calorier (lettering and design). No. 522,834, Class 18. Electric heating stoves for buildings.—Standard & Pochin Bros., Ltd., Standard Works, Evington Valley Road, Leicester.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses (258), Torry, for the T.C.

Accrington.—Houses (187), Steiner estate; borough surveyor.

Ashford (KENT).—Houses (£20,662), for the U.D.C.; J. W. Waller, builder.

Axbridge (SOMERSET).—Development of estate at Locking for Fry, Stroud & Bennett; Leete & Darby, architects.

Barking.—Electrical installation at premises near Highbridge Road; Trinidad Leaseholds, Ltd. Houses (135), Upney Farm estate, for the U.D.C.; surveyor. Estate development, Ribble Road; Lord & Mellodew. Shops and estate, Longbridge Road; H. E. B. Meech.

Basingstoke.—Wesleyan Chapel, Bramley (£1,100); trustees.

Bexley (KENT).—Houses (55), Pickford Lane, Bexley Heath, for H. G. Cooper. Houses (20), Shooter's Hill, Welling, for Peck & Flower. Houses (90), Welling, for Barnes & Bridge, Bexley Heath.

Birkenhead.—Conversion of "Beechwood," Park Road North, to nurses' home, for the General Hospital; Woolfall & Eccles, architects, 60, Castle Street, Liverpool. Elementary school, Alpha Drive (£37,691); J. A. Milestone & Son, Wallasey.

Birmingham.—Baptist church, Yardley Wood; trustees.

Birstall (Yorks.).—Houses (32), Raikes Lane, for J. Akeroyd & Son.

Bognor Regis (SUSSEX).—War memorial hospital; C. W. Symes, architect.

Bootle.—Houses (36), Fernhill Road, for the Corporation; J. W. Jones & Son, Ltd., builders, Allerton, Liverpool.

Bournemouth.—Houses (136), Iford, for the T.C.; F. P. Dolamore, borough engineer.

Bradford.—Extensions to works for the Mulcott Belting Co., Ltd., Cutler Heights Lane, Dudley, Hull; Hadfield & Cawkwell, Cairn Chambers, 19, St. James Street, Sheffield.

Bradford-on-Avon (WILTS).—Co-operative stores; W. Selfe & Son, builders.

Brentford.—Extension of baths (£8,000); surveyor to the Council. Extensions to factory, Great West Road, for Trico-Folberth; F. E. Simpkins. Offices and flats, Great West Road; E. H. Burgess, Ltd. Ten shops, Great West Road; Hearn & Chuter.

Bury.—Houses, Woodhill (£83,400), for the T.C.

Chester-le-Street.—Houses (137), Birtley, for the R.D.C.

Chichester (SUSSEX).—Isolation hospital extensions (£6,000) for the T.C.; city surveyor.

Clitheroe.—Re-erection of portion of mill for Foulsykes Manufacturing Co.; C. V. Exley, managing director.

Croydon.—School, Addington (£7,802), for the borough E.C.; R. Mansell, builder.

Cumberland.—Alteration to Waricksland Council School for the E.C.; J. & R. Bell, builder, Carlisle.

Dagenham (ESSEX).—Houses (128) for the U.D.C.; surveyor.

Dover.—Rebuilding Priory Station for the Southern Railway Co., Ltd.; Rice & Son, builders, Margate and London.

Dumfries.—Creamery, Hood's Loaning (£4,500), for the Dumfries and Maxwelltown Co-operative Society; Mr. Mercer, architect.

Dundee.—Shops, Sandeman Street; J. Johnston, architect.

Durham.—Schools, Castle Eden, Seaton Snook, Hurworth-on-Tees, and Seaham Harbour (336 places), for the county E.C.; F. Willey, architect, 34, Old Elvet. R.C. schools, Crawbrook, Ryton; Charlton & Son, builder, Crawbrook, Ryton.

Easington Colliery (DURHAM).—Miners' welfare institute (£6,000); Hays & Gray, architects, Central Chambers, Wingate.

Eastbourne.—Houses (62) for the T.C.; borough surveyor. Development of Peppercombe estate; Rowsell & Ticehurst.

Essex.—Schools, Rainham, Ongar, West Thurrock, Leigh Beck, and Laindon, for the county E.C.; J. Stuart, county architect, Chelmsford. Extensions to Newport Grammar School (£6,814); governors. Extensions to Severalls Mental Hospital (£52,000); county architect, Chelmsford.

Gateshead.—Houses (297), Old Fold site, for the T.C.; F. H. Patterson, borough engineer, Swinburne Street.

Glasgow.—Clearance, Old Shettleston Road area; city engineer. Alterations and improvements to Grosvenor Restaurant, for Smith (Glasgow), Ltd., 74, Gordon Street, C.1; J. N. Galt and Geo. Barr, architects, 59, Bath Street. Conversion of mansion, King's Park, into tea room and museum (£2,000); parks superintendent.

Glossop (DERBYSHIRE).—Bazaar Stores, High Street West, for F. W. Woolworth & Co., Ltd., Kingsway, London, W.C.

Grangemouth.—Buildings for the Grangemouth Co-operative Society; the manager.

Grantham.—Business premises, St. Peter's Hill; Read Bros., builders. Methodist church, Harrowby; trustees.

Hastings.—Extensions, tram depôt, Beaufort Road; Hastings Tramway Co.

Havant.—Houses (30), Staunton Road site, for the U.D.C.; surveyor.

Heston and Isleworth.—Houses (90), Allen's estate, Isleworth; H. Allen. Houses (90), Lyon Hill estate, for Gordon Carrington & Co.; G. Gale. School, London Road, Isleworth, for the U.D.C. (£23,804); W. J. Harris, contractor, Hounslow.

Horsham (SUSSEX).—Houses (24), for the Southern Railway Co., Ltd.

Hull.—Houses (168), Marfleet Lane; Sutton trustees.

Irish Free State (ARDEE).—Extensions to hospital (£1,500) for the County Louth Board of Health. (ARKLOW, Co. WICKLOW).—Extensions to hospital for the Countess of Wicklow Memorial Hospital Council; E. M. Murphy, engineer, 27, Molesworth Street, Dublin. (ARDNAGRIENA, Co. TIPPERARY).—Houses (22) for the U.D.C.; Roche, Morrissey & Kennedy, Clonmel. (DROGHEDA).—Extensions to hospital (£5,000) for the County Louth Board of Health. (DUNDALK).—Extensions to hospital (£2,500) for the County Louth Board of Health. (LIMERICK).—Houses (22), Castle Barracks; borough surveyor. (NEW ROSS).—Waterworks filtration plant; Delap & Waller, 115, Grafton Street, Dublin.

Jarrow-on-Tyne.—R.C. day school; R. Burke, architect, 12, Grey Street, Newcastle-on-Tyne.

Kirkintilloch.—Re-erection of premises for Alexanders Stores, Ltd., Argyle Street, Glasgow.

Lanarkshire.—Houses (24), Carstairs, with electric lighting work, for the C.C.; P. C. Smith, architect, 13, Clydesdale Street, Hamilton.

Lancashire.—Secondary school, Timson estate, Failsworth, for the county E.C.; director of education, Preston.

Lancaster.—Houses (50), Rylands estate (£14,317); Nicholson & Wright, Ltd.

Leeds.—Alterations, Little Theatre, Cookridge Street; Miss Gwendolen Lally.

London (EAST HAM).—Additions to central baths for the B.C.; borough engineer. Alterations, 699, Romford Road; W. Evans, architect. Nursery block, poor law schools (£21,000); G. A. Allan, architect. (FULHAM).—Buildings, Rannoch Road; J. Lyons & Co., Ltd. (HACKNEY).—Reconstruction to premises in Homerton Road; Messrs. Goulds.

Maidstone.—Houses (110), London Road, for Cox Bros., Lower Stone Street.

Mildenhall (SUFFOLK).—Houses (52) for the R.D.C.

Mitcham (SURREY).—Houses (46), Gorringe Park, for Isaac Wilson.

Nether Broughton (MELTON MOWBRAY).—Re-erection of engine and boiler house, electrically equipped, for H. Thompson and Sons, Ltd., 7, Elliot Street, Liverpool.

Newcastle-on-Tyne.—Houses (2,000) and additions to Wingrove Council School for the E.C.; J. W. Steele, city engineer, Town Hall.

Northampton.—Printing works extension, Wellington Street; Archer & Goodman.

North Riding.—Elementary school, Fifth Avenue, York, for the E.C.

Northern Ireland.—(BELFAST).—R.C. schools; rural dean. (LONDONDERRY).—R.C. school; rural dean.

Paddock Wood (KENT).—Canning factory for the Wisbech Produce Canners, Ltd.; S. W. Smedley, managing director.

Rainhill (LIVERPOOL).—Houses (50) for County Mental Hospital staff; Richard Owen & Son, architects, 3, Crosshall Street, Liverpool.

Reigate.—Cinema theatre, London Road, for G. A. Hodgkins.

Ripon.—Showrooms, Low Skellgate; Mr. Glover.

Rotherham.—Church, East Dene (£8,000); Rev. C. W. Scott, curate-in-charge, St. James' Church, Clifton.

Rugby.—Extension of Regent Street baths; surveyor to the U.D.C.

Rye (SUSSEX).—Cinema theatre for Shipman & King, proprietors of the Electric Palace.

Seaton Hirst (NORTHUMBERLAND).—Church (£6,500); R. & G. Brown, builders, Backfield House, Amble.

Selkirk.—Sewage purification works (£32,000); burgh surveyor.

Sheffield.—Houses (44), Manor estate; W. G. Davies, city architect. Houses (34), Dykes Hall estate (£16,115); M. J. Gleeson, Ltd. Extensions to City General Hospital, city architect.

Shipley.—Houses (50) and shops, Wrose Road; A. & F. Mellor.

Shipston-on-Stour.—Waterworks; Dodd & Watson, engineers, Wellington House, Bennetts Hill, Birmingham.

Slough (BUCKS.).—Houses (66), St. Andrew's estate, Cippenham, for F. Iona Smith.

Solihull.—Houses (32), Damson Lane; W. T. Orton, architect, 86, New Street, Birmingham.

Southampton.—New joiners' workshop at the Corporation depôt, Shirley; borough engineer, 33-35, French Street.

Southport.—Houses (116), Guildford Road site; A. E. Jackson, borough engineer. New "Plaza" cinema and café, Mersey Square (£60,000); Thomas Collier & Sons, builders, Brown Street Works, Leigh.

Stoke-on-Trent.—Schools, Edensor (£26,420) and Northwood (£12,970) for the E.C.

Tamworth (STAFFS.).—Houses (24) for the R.D.C.; surveyor. Extension of school, Wilnecote; trustees, Congregational Church.

Tanfield.—Houses (40) for the U.D.C.; surveyor, Town Hall.

Tipton.—Public baths; surveyor to the U.D.C.

Tynemouth.—Shops and flats, Heaton Terrace; J. W. Hanson and Son. School for the E.C.; Hays & Gray, 50, Camden Street, North Shields.

Walsall.—Shops and offices, Leicester Square and Freer Street, for the T.C.

Warrington.—Co-operative stores, Westy Lane; C.W.S. architect, Balloon Street, Manchester.

Wednesbury.—Houses (34), Hydes Road; A. Booth, borough engineer, Town Hall.

Wellington (SALOP).—Houses (38) for the R.D.C.; surveyor.

West Hartlepool.—Infectious diseases hospital, with lighting and central heating (£40,000), for the T.C.; borough surveyor.

Whiston (LANCS).—Houses (56), Tarbock Road, for the R.D.C.

Wolverhampton.—Houses (120) for the T.C.; A. M. Griffiths and Son, Ltd., builders. Tabernacle, Dunstall Road; J. Clark, builder, Pipers Row.

York.—Dairy, Haxby Road, for the York Equitable Industrial Society, Railway Street; architect's department, C.W.S., Ltd., 1, Balloon Street, Manchester. Estate development, Hull Road; H. Williamson. Clearance, Layerthorpe area; city engineer.